S. HRG. 99-168

GROUND WATER CONTAMINATION AND PROTECTION

HEARINGS

BEFORE THE

SUBCOMMITTEE ON TOXIC SUBSTANCES AND ENVIRONMENTAL OVERSIGHT

OF THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

NINETY-NINTH CONGRESS

FIRST SESSION

JUNE 17, 20; AND JULY 16, 1985

Printed for the use of the Committee on Environment and Public Works

U.S. GOVERNMENT PRINTING OFFICE
49-921 O WASHINGTON : 1985

S321-28

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GROUND WATER CONTAMINATION AND PROTECTION

MONDAY, JUNE 17, 1985

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON TOXIC SUBSTANCES AND
ENVIRONMENTAL OVERSIGHT,
Washington, DC.

The subcommittee met, at 9:50 a.m., in room SD–406, Dirksen Senate Office Building, Hon. Dave Durenberger (chairman of the subcommittee) presiding.

Present: Senators Durenberger, Baucus, and Humphrey.

OPENING STATEMENT OF HON. DAVE DURENBERGER, U.S. SENATOR FROM THE STATE OF MINNESOTA

Senator DURENBERGER. The hearing will come to order.

I apologize to the witnesses and to the other people in the audience for my tardiness this morning.

This is the first hearing in what we expect will be a long series of hearings that this subcommittee will hold on the subject of ground water contamination. For the time being, we intend to focus on the resource rather than a specific piece of legislation.

Although these are oversight hearings, I have for some time expressed an interest in developing ground water legislation. I expect that the testimony that we gather at these hearings will be helpful in designing a bill. We would like to have a draft available for broad circulation in July.

Why do we need a national ground water protection policy written into Federal law? I can think of six quick reasons.

Ground water is the drinking water resource for about 50 percent of our population or 117 million Americans. Unlike surface waters in which pollutants are thoroughly dispersed and which are most often treated before consumption, ground water can contain very high concentrations of contaminants. So first, is public health.

Second, ground water is not adequately protected by current law. In fact, current law works to make ground water aquifers the dump of choice. We require BAT for surface waters and will soon for land resources. The progression of our pollution laws has made underground injection the principal disposal technology for hazardous waste. Ground water contamination is of increasing concern, in part because we have laws to protect everything else and those laws are now becoming effective.

Third, to the extent that potential sources of contamination are regulated, the regulations most often come from the Federal Government. Hazardous waste facilities, pesticides, pipelines, under-

ground storage tanks, underground injection, hazardous materials transportation, surface mining, and point and nonpoint pollution of surface waters. In each case these sources are addressed by an existing Federal regulatory program. Not every Federal regulatory program works well, but I don't know that I can name any source of potential contamination that is well-regulated, nationwide, under State and local law. The existing Federal programs require better coordination, and in some cases we need to make additions as we did last year with the leaking underground storage tank legislation.

Fourth, the Environmental Protection Agency has a strategy and the States are beginning to design protection programs, but it is apparent that there is, as yet, no consensus of the fundamentals. I do not think that we should build our ground water protection programs on water quality standards, as we did in the first round of surface water pollution control. But many of the States are once again headed off in just that direction. I do not think we should be classifying aquifers as is proposed in the EPA strategy. But many would flatly assert that there is no realistic alternative. Congress owes the agency, the States, and the public some guidance on these and other fundamental questions before we move much farther on a national ground water protection strategy.

Fifth, it would be cheaper to have a ground water protection policy. Compared to cleanup, the prevention of contamination is a low-cost technology. And the Federal Government is about to become the major responsible party for cleanup. Read the Superfund bills now moving through Congress. We are going to impose a new general purpose tax to raise the revenue. We will most probably relieve the States of a large share of the operations and maintenance expenses they are now bearing. The average Superfund site now costs $6 million for cleanup and the cost is ever rising. In some places they are planning to pump ground water through carbon filters for decades to achieve a desired level of restoration. So we need a comprehensive Federal ground water protection policy as simple self-defense.

Sixth, and finally, ground water is essentially a nonrenewable resource. When this generation contaminates the ground water supply—through carelessness or intentionally because it is plentiful—the water will remain contaminated for the generations to come. It is my experience that only the National Government makes a good effort at defending the interests of posterity, and even then only occasionally. Let us hope that this will be one of those occasions, that from these hearings we can together develop a comprehensive Federal ground water protection program.

I am convinced that it is needed, and I am looking for help from each of you to show us how.

Our first panel this morning includes Dr. Philip Cohen, the Chief Hydrologist of the U.S. Geological Survey, and Dr. Joseph Rodricks, who is principal of the Environ Corp., Washington, DC.

Gentlemen, we appreciate your being here. Your full statements will be made part of the record. You may proceed. You have 10 minutes each. Mr. Philip Cohen.

STATEMENT OF PHILIP COHEN, CHIEF HYDROLOGIST, U.S. GEOLOGICAL SURVEY

Mr. COHEN. Thank you, Mr. Chairman. My remarks this morning are intended to provide this committee with an overview of the ground water resources of the United States with reference to quantity, quality, and water use. Clearly, with the time allotted to me I will only be able to touch upon what I hope are some of the more significant highlights.

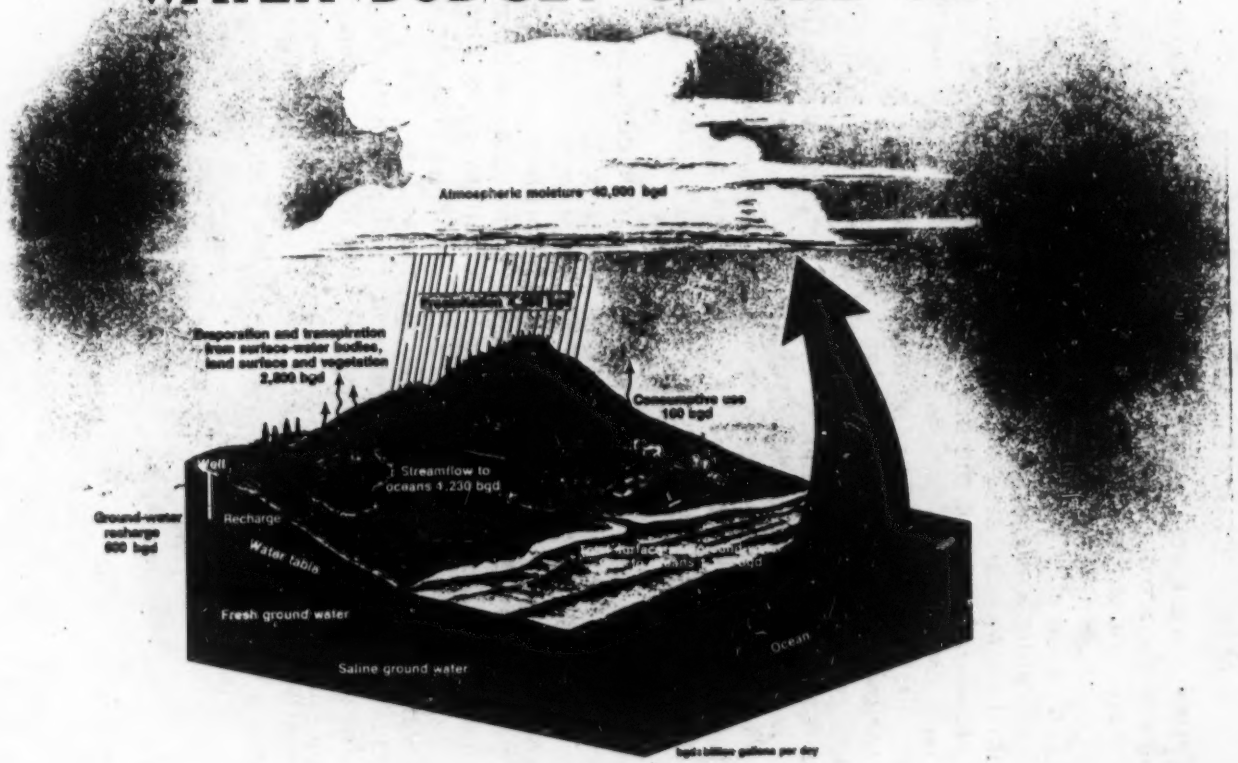
I would like to note at least some of the information I will be talking about and some of the briefing boards we will be discussing are derived from a new publication called "The National Water Summary 1984." For those in the audience, order forms are available in the event you are interested.

If I may, now, I would like to go to the briefing boards.

Any consideration of ground water must be done within the context of the hydrologic cycles or, as implied in your opening remarks, if one manipulates one component of the hydrologic cycle, it is inevitable the other components will respond. So I would like to briefly review the hydrologic cycle and place ground water within that context.

We can begin by noting that average annual precipitation in the 48 States of the United States is on the order of 4,200 billion gallons per day. Disposition of that precipitation is as follows: 2,800 billion gallons per day are consumed by evaporation and transpiration, approximately 100 billion gallons per day from consumptive use related to the activities of man, 1,300 billion gallons per day runs off to the sea, of which about 70 billion gallons per day is ground water and the remainder is surface water. And as a loop within that cycle, of particular interest to these hearings, is the component of ground water recharge. That is the component of precipitation that infiltrates into the ground, into what we refer to as the ground water reservoir. That reservoir is subdivided into various layers, oftentimes referred to as aquifers.

WATER BUDGET OF THE U.S.

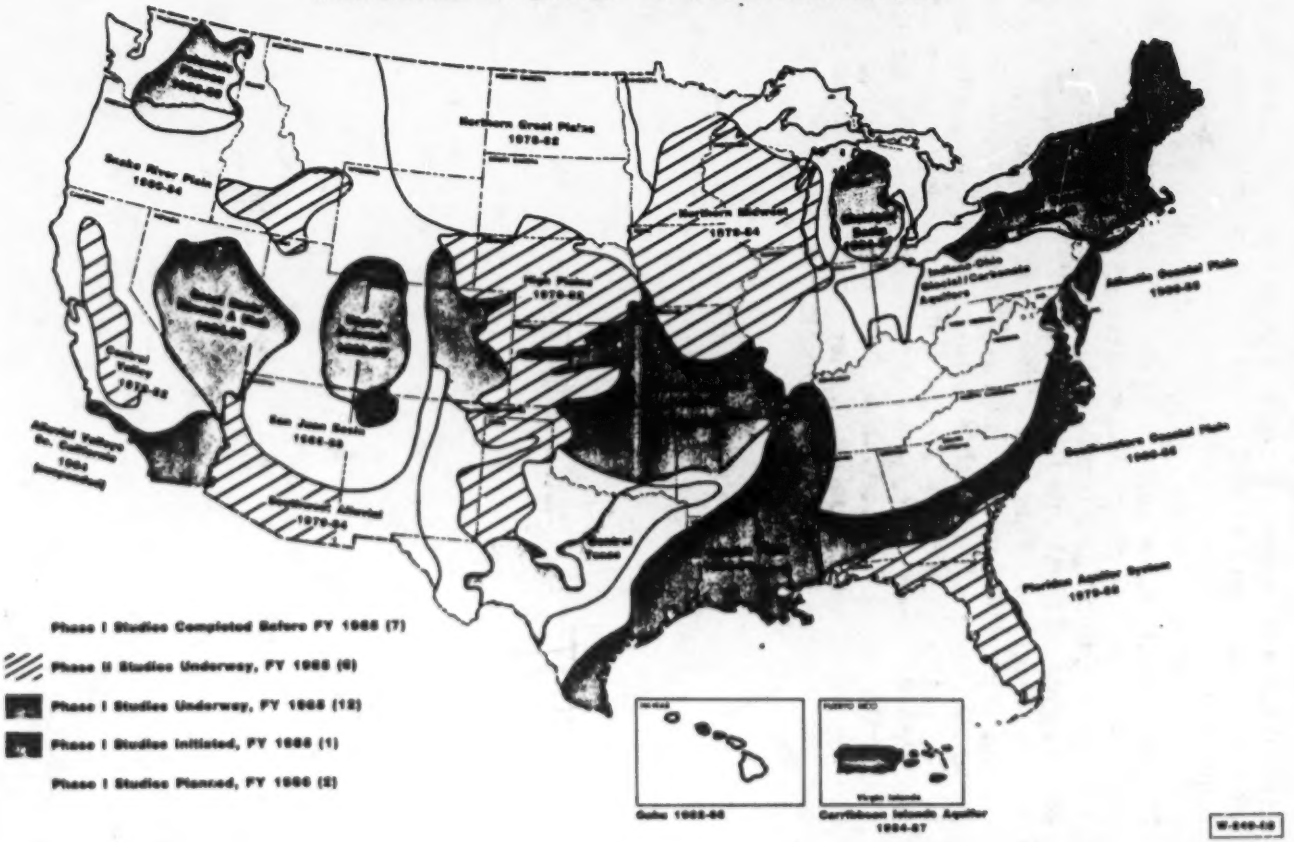


In this diagram we try to depict the fact that commonly aquifers are not homogeneous; they can be separated, for example, by layers of clay. This can affect the movement of ground water and cause a number of phenomena, amongst others artesian aquifers.

Depending upon scale, there are literally thousands of aquifers in the United States; and thus, one of the issues of concern is the attempt to classify those aquifers.

From a national perspective, we have classified the regional aquifer systems of the United States into 28 major units. These units are characterized by, among other things, producing about 80 percent of the ground water which is currently pumped in the United States. To provide you with a sense of scale, one aquifer unit would be the entire Central Valley of California, which, incidentally, is the largest source of ground water pumpage in the United States. The entire Atlantic and Gulf Coastal Plain is referred to as an aquifer system. Other aquifer systems that are of considerable concern include the High Plains-Ogallala System.

REGIONAL AQUIFER-SYSTEM ANALYSIS PROGRAM

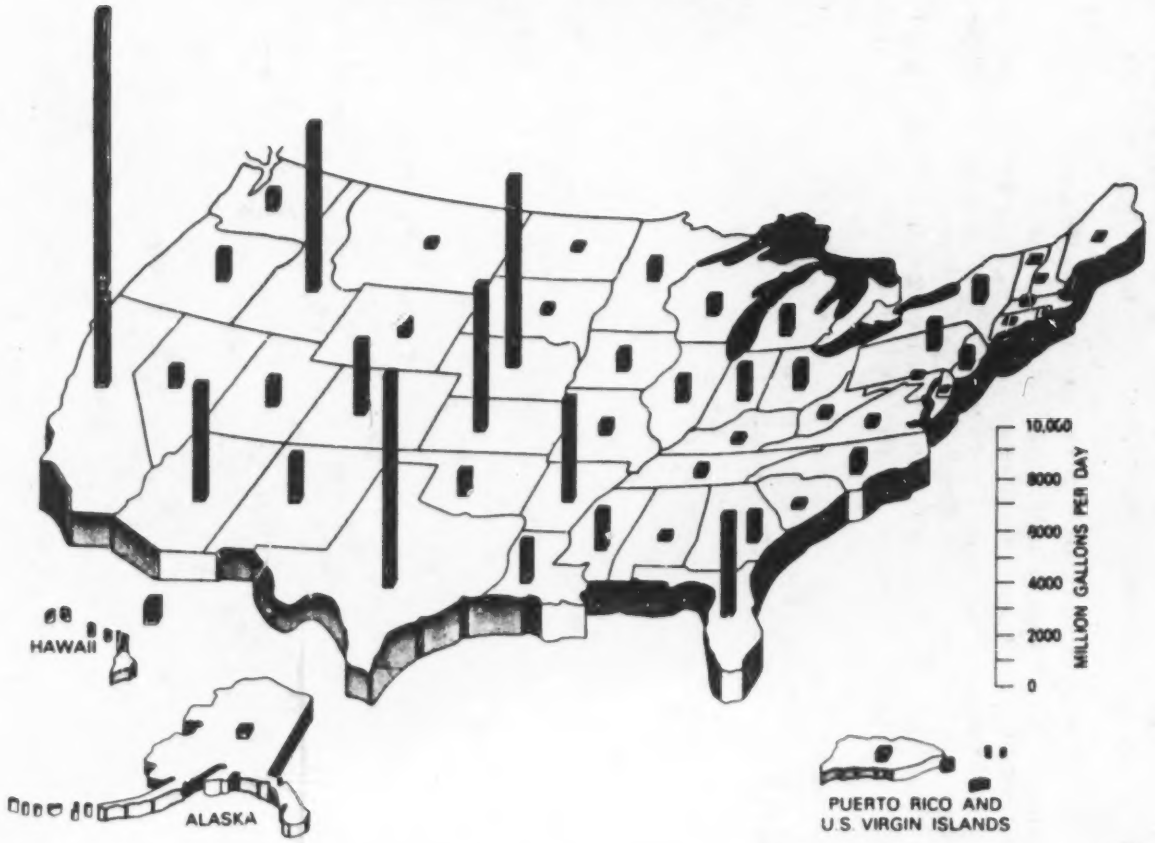


We are presently nearing completion of overview investigations of the quantity aspects of 17 of the regional ground water physical systems, with some information on the occurrence of natural major chemical constituents.

As I indicated before, total ground water withdrawals in the United States are approximately 88 billion gallons per day. As you stated in your opening statement, those ground water withdrawals provide somewhat more than 50 percent of the water consumed by people in the United States.

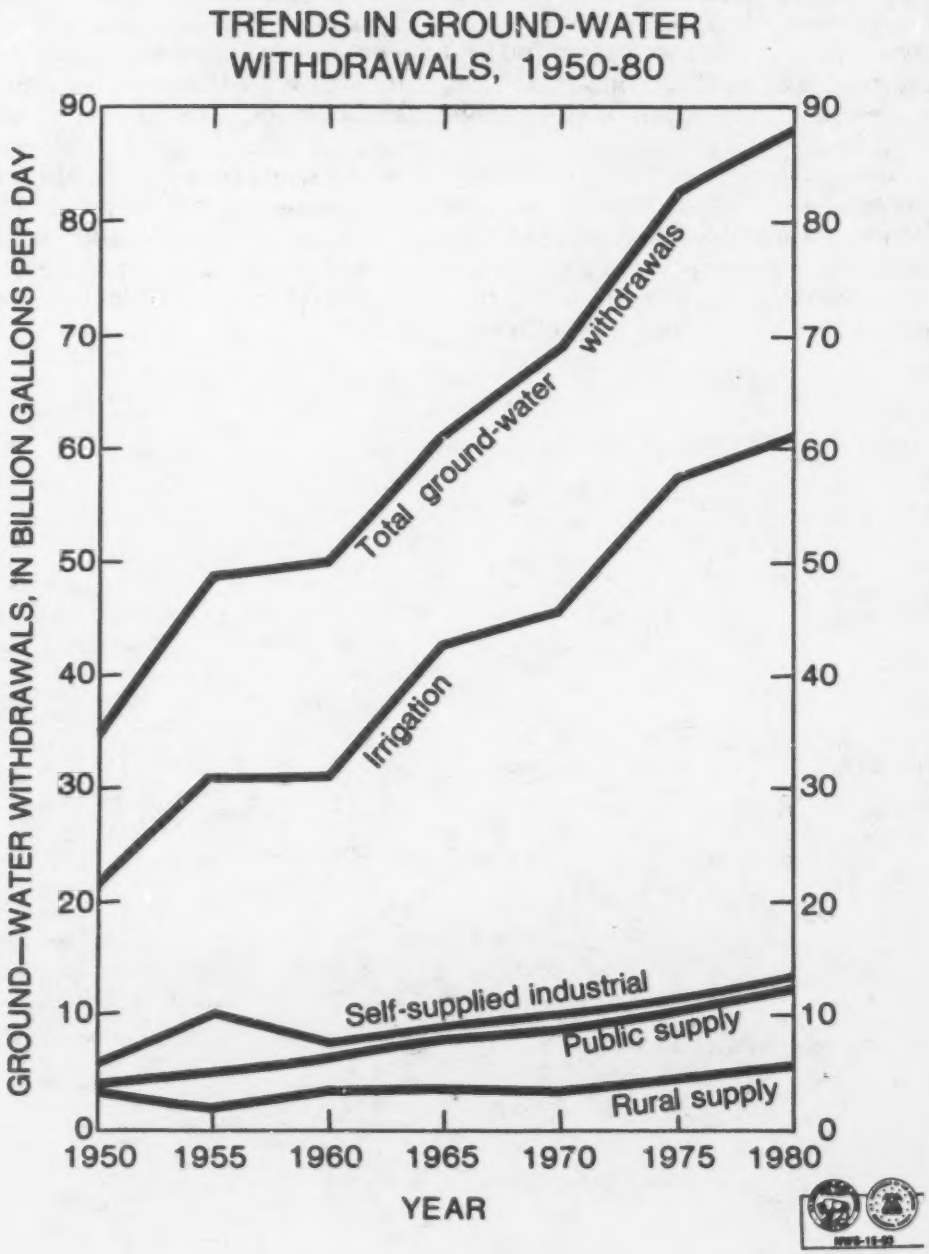
However, the largest consumption of ground water clearly is for irrigation, as evidenced by the fact that pumpage in the Central Valley of California is on the order of 14.6 billion gallons per day, the largest single withdrawal in the country. The second largest is in Texas at 9.6, then Nebraska at 7.1, and so on. Most of these withdrawals are for agriculture.

GROUND-WATER WITHDRAWALS, 1980
(million Gallons Per Day)



Although the Federal Government, in particular the agency that I represent, has been investigating ground water for nearly 100 years, public interest in ground water really developed sometime in the past two or three decades. That coincides with the very dramatic increase in ground water usage, as shown on this board, from 1950 to 1980.

Ground water pumpage in 1950 was on the order of 35 billion gallons per day. As stated previously, it is now on the order of 88 billion gallons per day. Rural supply and public supply and self-supplied industrial pumpage has increased slightly, but the dominant increase has been for irrigation. The sum of those uses is shown by the red bar on the briefing board.


TRENDS IN GROUND-WATER WITHDRAWALS, 1950-80
GROUND—WATER WITHDRAWALS, IN BILLION GALLONS PER DAY
90
80
70
60
50
40
30
20
10
0
1950
1955
1960
1965
1970
1975
1980
YEAR
Total ground-water withdrawals
Irrigation
Self-supplied industrial
Public supply
Rural supply

The next board shows in a very gross sense the impacts of such development, in a quantitative sense, upon the ground water of the United States. On this board we have shown in very general fashion those portions of the United States where water levels have declined 40 feet or more as a result of pumpage.

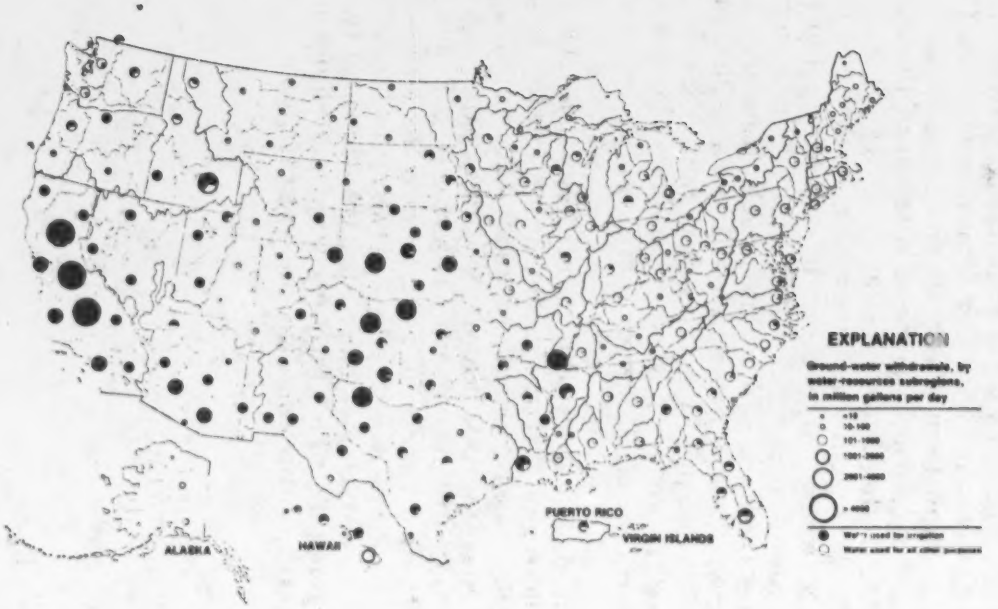
It is not surprising to see a coincidence between areas of heavy pumpage and areas of significant drawdown. In the Central Valley of California, drawdown about 10 or 15 years ago was about 300 feet. It has now recovered some as a result of the increased use of surface water in the Central Valley.

There is a very significant drawdown in the area of Chicago and Minneapolis, where large cones of depression have merged. We note a drawdown of as much as 800 feet. There is significant drawdown in the Dakotas, which dates back to before the turn of the century when shallow artesian wells were drilled and allowed to flow. Those wells initially had heads of more than 50 feet above the land surface. The heads now are virtually at land surface. That defines a drawdown of 40 feet or more. And so on around the country.

As I mentioned earlier, the High Plains-Ogallala Aquifer system is one of the major systems in the United States. It supports an irrigated agricultural economy of about $20 billion a year. It is an area of intense interest. But you will notice that the drawdowns of 40 feet or more are very spotty. The most significant concern right now is in the panhandle of Texas where the aquifer is quite thin.

These drawdowns, which are somewhat on the order of 100 feet, represent a dewatering of more than two-thirds of the aquifer. Well fields are going dry. This foretells what may happen in the future if development continues at the present rate.

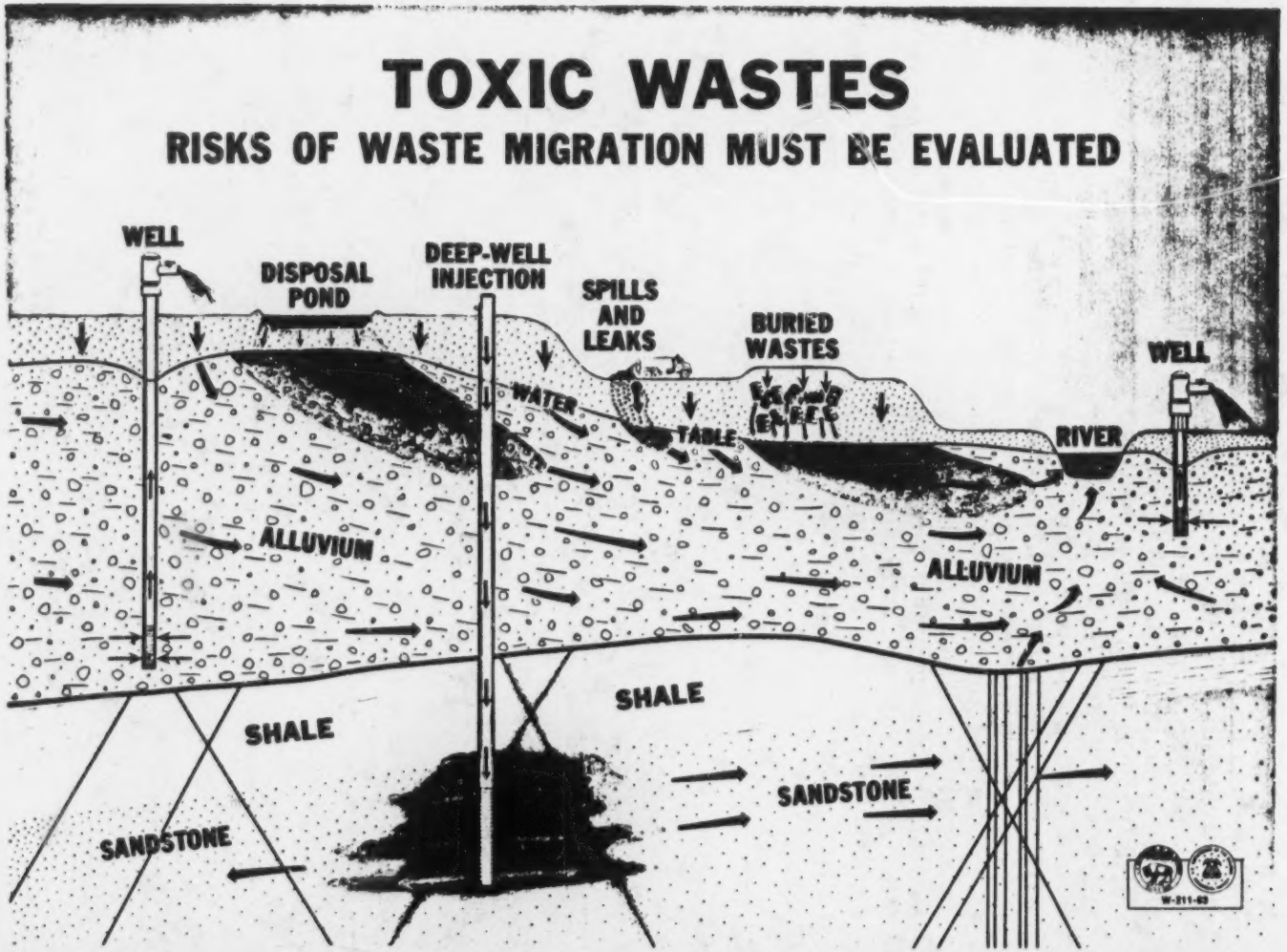
GROUND-WATER WITHDRAWALS, 1980



That is a very brief statement about ground water quantity. Now let's look for a moment at ground water quality.

This diagram attempts to depict the major sources of ground water contamination in the United States. These areas of ground water contamination, in hydrologic terms, are referred to as plumes of contamination. We have shown several sources including disposal ponds, deep well injection, inadvertent spills and leaks, and buried wastes. As a matter of fact, salt water intrusion from the sea is another source of ground water contamination.

Note that the plume resulting from leakage from buried waste is moving toward the river. Here you see an interaction between surface water and ground water. It is not uncommon for ground-water plumes to contaminate surface water, nor is it uncommon for surface water to contaminate ground water. So any legislation or any other considerations concerning the protection of ground water inevitably will require an understanding of the interaction between surface water and ground water.


TOXIC WASTES
RISKS OF WASTE MIGRATION MUST BE EVALUATED
WELL
DISPOSAL POND
DEEP-WELL INJECTION
SPILLS AND LEAKS
BURIED WASTES
WELL
WATER TABLE
RIVER
ALLUVIUM
ALLUVIUM
SHALE
SHALE
SANDSTONE
SANDSTONE
W-211-63

Finally, what can we say about the chemical quality of the nation's ground water from a national perspective? Unfortunately, we can say very little. Despite the fact that my agency and many other agencies have been looking at ground water for many, many years, the only contaminant for which we can make a general statement on a nationwide scale is nitrate. That results from the fact that nitrate has been of concern to the medical community for more than 50 years.

There has been clinical evidence associating high levels of nitrate with a number of diseases associated with newborn infants. That is the reason we have a lot of nitrate information in our files.

NITRATE AS NITROGEN IN GROUND WATER
DATA FOR COUNTIES
NITRATE AS NITROGEN
Fewer than 5 sampled wells county
Water from less than 25 of sampled wells contained more than 3 milligrams per liter
Water from 25 of sampled wells contained more than 3 milligrams per liter

What we have attempted to do in this diagram is statistically manipulate those data to try to determine whether or not we can make some statements that are national in significance. If you will bear with me for a moment, one of the major points I want to make with this diagram is how little we know and the types of generalizations we must make in order to give you these types of depictions.

We looked at the analyses of water from about 125,000 wells collected over a period of about 25 years. Some of the criteria that we used to select those analyses were (a) information about the quality control with regard to how the samples were collected and how the analyses were made, and (b) the availability of the information itself.

There are literally tens of thousands of bits of information scattered here and there around the country. Much of that information is questionable in terms of one not being able to get insights on quality control and quality assurance and simply not being able to get the information itself.

Based upon those 125,000 samples, we used a criterion specifying that if any county had 5 or more samples, 5 or more samples per county, we would put those data into our computer and call back those counties in which we detected nitrate in 25 percent or more wells above a threshold of 3 milligrams per liter. We selected 3 milligrams per liter largely on the basis of professional judgment. Three milligrams per liter is significantly below the Public Health Service standard or, excuse me, the Environmental Protection Agency standard. That shows how long I have been working with this.

The assumption was made that where we saw 3 milligrams per liter or more, we could at least presume the possibility of groundwater contamination resulting from the activities of man. The pink areas depict counties where more than 25 percent of the sample exceeded 3 milligrams per liter. The blue areas are counties where less than 25 percent of the sample exceeded 3 milligrams per liter. The white areas are portions of the country for which we had insufficient data.

Note the coincidence of high nitrate content in the High Plains Ogallala System. I hypothesize here that the high nitrate content is associated with the use of fertilizers. Long Island is entirely pink, representing the disposal of domestic wastes from something on the order of 50,000 cesspools and septic tanks, which followed a fairly extensive agricultural economy throughout most of Long Island. Similarly, the nitrate in the Central Valley of California probably is in large part attributable to irrigated agriculture.

It is significant to note that a map of this type has not been made for any other trace constituent or hazardous chemical in ground water simply because the data bases do not exist. So, if this committee or any other entity in the country is interested in a national perspective as to the health of our ground water, the information simply is not available.

That is one of the key messages that I would like to leave the committee with. I would be glad to try to respond to any questions.

Senator DURENBERGER. Dr. Rodricks?

STATEMENT OF JOSEPH RODRICKS, PRINCIPAL, ENVIRON CORP., WASHINGTON, DC

Mr. RODRICKS. Thank you, Mr. Chairman.

I would like to report today on some of the principal findings of a study on ground water contaminants performed by our firm in 1983 for the Office of Technology Assessment. Our study concerned the possible effects on human health of contaminants that have been identified in our Nation's ground waters and also contained a discussion of various devices—primarily standards that define acceptable exposure limits—that might be used to protect human health. We did not examine issues concerning the costs of achieving various levels of protection and current technological capabilities for doing so.

Whether and to what extent chemical contaminants of our Nation's ground water threaten the public health cannot now be determined with the degree of certainty we would ideally like to have as a basis for public policy development. In most respects this difficulty is not unique to ground water but is common to almost all attempts to assess the risks of environmental contamination.

The only tool we have to acquire direct knowledge of the health consequences of human exposure to contaminants, the science of epidemiology, is a relatively insensitive one, and the circumstances under which human exposure to ground water contaminants occurs make it unlikely that epidemiologists will be able to provide anything but inconclusive answers to questions about health effects. This is not to say that such investigations should not be carried out, but it is only to warn against overly optimistic expectations.

The only other scientific tools available to gain an understanding of the health impacts of environmental contaminants are those of experimental toxicology. While many of these tools are capable of identifying the health effects of environmental agents, they can usually do so only under conditions substantially different from the actual conditions of human exposure.

When we use the vast quantity of available experimental toxicity data to assess the risks of ground water contaminants, we necessarily have to invoke a variety of assumptions and inferences whose accuracy is unknown. The social demand for knowledge about the health consequences of exposures to environmental contaminants greatly exceeds the bounds of current scientific knowledge and forces scientists to make judgments that are not purely scientific in content.

Given these circumstances, it is not surprising that different scientists may reach quite different judgments about the health consequences of exposure to environmental contaminants.

Having said this, I should immediately add that we need not be paralyzed by the lack of a high degree of scientific certainty. We do know a good deal about the toxic properties of a substantial number of the chemicals thus far identified as ground water contaminants, and we can draw upon the methodologies developed for other classes of environmental agents to reach some conclusions about the potential health impacts of ground water contaminants. We can also draw on these experiences to assist with the question of limiting human exposures to such contaminants. To the extent

the available data allowed, we drew on these existing methodologies in examining the questions posed to us by OTA.

Let me now proceed to some of the more specific and significant findings and conclusions of our study.

No. 1, a very wide variety of chemical contaminants has been identified in the Nation's ground water. Almost every major class of organic structural types is represented; metals and other inorganic substances, most of which arise from both natural and industrial sources, are also well represented.

No. 2, verifies what Dr. Cohen just said. Data on the occurrence of contaminants in ground water, while extensive, are neither complete (in terms of the number of different chemicals that may occur) nor representative (i.e., there has been no comprehensive sampling and analysis of contaminants to produce a representative picture of the levels and pervasiveness of these contaminants or of the number of people exposed to them).

In the absence of such data (which are necessary to estimate the magnitude and nature of human exposures) it is not possible to reach definite conclusions about the magnitude of the health risk we now face as a result of ground water contamination, at least on a national basis. It certainly would be possible to conduct risk assessments at specific sites where appropriate data are available on levels of contamination and on the exposed populations. We did not undertake any such assessments.

No. 3, although the available data are inadequate to predict risk on a national basis, they can at least be used to identify the types of health hazards that might be associated with ground water contaminants should exposures reach sufficiently high levels. Our analysis revealed that many substances present in ground water have the capacity to cause eye and skin irritation, liver and kidney damage, adverse effects on the nervous system, and to increase the risk of cancer. I have attached Tables VII through XI of our report which tabulate those specific substances and those specific health effects.

We found very few of the known contaminants are known to have the capacity to cause reproductive disorders, birth defects, or effects on the immune system. We should recognize that these conclusions in part reflect the fact that the toxicity and epidemiologic data bases available for contaminants are highly uneven and that many contaminants have been poorly tested while others have been rather well tested. I have attached a table that lists some of those that have been rather poorly tested.

I also reemphasize that in the absence of data on the magnitude of human exposure, we cannot conclude that any of these potential hazards are or will be realized in humans exposed to contaminated ground water. We only suggest the potential for both major and minor health effects exists and that further inquiry is probably warranted.

Point No. 4. In many cases substances have been reported as contaminants simply because analytical methods have been readily available for measuring their presence. We identified a number of additional classes of substances that might well be present in some locations—table XV—and suggest that attempts be made to learn whether they are indeed present in ground water.

While it appears there is much to learn about the health impacts of ground water contaminants, there nevertheless remains the question of whether and to what extent human exposure to known contaminants needs to be limited.

In general, it is probably safe to say that limits on human exposure need to be established for most contaminants and that the limits should be based, at least in part, on the toxicological properties of those contaminants. Methods for setting such limits have been developed and applied in many other contexts, and no doubt can be applied to ground water contaminants, at least to those for which adequate toxicity data have been developed.

At the same time, as our report cautioned, the uncritical application to ground water contaminants of various standards developed for other purposes is almost certain to result in different—and probably unknown—levels of protection for different contaminants.

In our report, we suggested that EPA's ambient water quality criteria—table XIX—would appear to be of greatest potential utility in establishing limits on human exposure, provided they were updated and made to take into account the fact that there may be multiple sources of human exposure to some contaminants. There are other sources of information to guide standard setting processes, although each has limitations that need to be recognized before use.

Finally, I note that there is a methodology available to establish health protection standards for many contaminants assuming certain basic data are available and if an effort is made to undertake risk assessments based on these data. Our report provides guidance on how this might be accomplished in order to ensure a consistent level of health protection while recognizing the uncertainties inherent in any such analysis.

I should also point out that the type of standard setting we describe is based purely on health protection considerations and is probably incomplete in that it does not include the cost and technological criteria that commonly influence standard setting in other areas.

Although many of the conclusions presented in our report are tentative, we believe the data and risk assessment methodologies we describe may assist in identifying substances that need to be further studied and the priorities for such studies, for guiding epidemiologic investigations of specific sites, and in developing strategies for acquiring useful exposure data for risk assessment. We believe our report also points out the difficulties in uncritically adopting for ground water contaminants the various standards developed for other purposes and offers suggestions on how to avoid these difficulties.

I shall be glad to answer questions on these or any other aspects of our report. Thank you.

Senator DURENBERGER. Thank you very much.

[Attachments to Dr. Rodricks' statement follow:]

Note on Tables. The chemicals listed in these tables exhibit certain forms of toxicity under some conditions of exposure. It should not be inferred that any of the substances will cause adverse health effects under all conditions of exposure or that their presence in groundwater poses a health threat. Additional analysis of dose-response and exposure data are needed before any conclusions can be drawn about health effects. See referenced Environ report for additional information.

TABLE VII

KNOWN GROUNDWATER CONTAMINANTS HAVING THE POTENTIAL TO CAUSE SKIN OR EYE IRRITATION
(Taken from Table VI)

I. Organic Chemicals Other Than Pesticides

Aliphatic Hydrocarbons
- Dicyclopentadiene

Aromatic Hydrocarbons
- Benzene
- Naphthalene

Polynuclear Aromatic Hydrocarbons
- Acenaphthylene
- Pyrene

Alkyl-Substituted Aromatic Hydrocarbons
- Ethylbenzene
- Styrene
- Toluene
- 1,2,4-Trimethylbenzene
- Xylenes

Aliphatic Alcohols
- Benzyl alcohol
- Methanol

Phenols
- p-Tert-butylphenol

Ethers
- Diethyl ether
- Dioxane
- Tetrahydrofuran

Halogenated Aromatic Hydrocarbons
- Bromobenzene
- Chlorobenzene
- 2-Chloronaphthalene
- O-Chlorotoluene
- O-Dichlorobenzene
- p-Dichlorobenzene

Esters
- Bis-(2-ethylhexyl)phthalate
- Dibutyl phthalate
- Diethyl phthalate

Chlorophenols
- Pentachlorophenol

TABLE VII (Continued)

I. Organic Chemicals Other Than Pesticides (Continued)

Multifunctional and Miscellaneous Structural Types
- Alkyl benzene sulfonates
- Alkyl sulfonates
- Benzoyl chloride
- 4,4'-Methylene-bis-2-chloroaniline (MOCA)
- Dichlorobenzidine
- Dodecyl mercaptans

II. Pesticides

Chlorinated Hydrocarbons
- Aldrin
- 1,2-Dibromo-3-chloropropane (DBCP)

Herbicides
- Atrazine

Miscellaneous
- 2,4-Dinitrophenol

III. Petroleum Mixtures

- Gasoline
- Fuel oils and diesel

IV. Inorganic Chemicals

- Ammonia
- Antimony
- Barium
- Beryllium
- Chromium
- Cobalt
- Cyanide
- Magnesium
- Nickel
- Selenium
- Zinc

TABLE VIII

KNOWN GROUNDWATER CONTAMINANTS HAVING THE POTENTIAL TO CAUSE LIVER DAMAGE
(Taken from Table VI)

I. Organic Chemicals Other Than Pesticides

Aliphatic Hydrocarbons
- Cyclohexane

Polynuclear Aromatic Hydrocarbons
- Pyrene

Alkyl-Substituted Aromatic Hydrocarbons
- Ethylbenzene
- Styrene
- Toluene
- Xylenes

Aliphatic Alcohols
- Methanol

Ethers
- Dioxane
- Tetrahydrofuran

Halogenated Aliphatic Hydrocarbons
- Bromochloromethane
- Bromoform
- Carbon Tetrachloride
- Chloroform
- Chloromethane
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichlorethylene
- Dichloromethane
- 1,2-Dichloropropane
- Hexachloropentadiene
- Hexachloroethane
- 1,1,1,2-Tetrachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- 1,1,1-Trichloroethane
- Trichloroethylene
- Vinyl Chloride

TABLE VIII (Continued)

I. Organic Chemicals Other Than Pesticides

Halogenated Aromatic Hydrocarbons
- Bromobenzene
- Chlorobenzene
- 2-Chloronaphthalene
- O-Dichlorobenzene
- p-Dichlorobenzene
- Polybrominated biphenyls
- Polychlorinated biphenyls

Esters
- Bis-(2-ethylhexyl)phthalate

Chlorophenols
- Pentachlorophenol
- 2,4,6-Trichlorophenol

Multifunctional and Miscellaneous Structural Types
- Chlorinated-dibenzo-p-dioxins
- Dichlorobenzidine
- 4,4'-Methylene-bis-2-chloroaniline (MOCA)
- Nitrobenzene
- N-Nitrosodiphenylamine

II. Pesticides

A. Chlorinated Hydrocarbons
- Aldrin
- Chlordane
- 1,2-Dibromo-3-Chloropropane (DBCA)
- DDT
- Dieldrin
- Endosulfan
- Endrin
- Kepone
- Toxaphene

B. Carbamates
- Carbofuran

C. Organophosphates
- Chloropyrifos

D. Phenoxy Herbicides
- 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)
- Silvex

E. Other Herbicides
- Bromacil

III. Petroleum Mixtures

- Jet Fuel

IV. Inorganic Chemicals

- Antimony
- Beryllium
- Chromium
- Copper
- Iron
- Manganese
- Selenium
- Thallium
- Vanadium

TABLE IX

KNOWN GROUNDWATER CONTAMINANTS HAVING THE POTENTIAL TO CAUSE KIDNEY DAMAGE
(Taken from Table VI)

I. Organic Chemicals Other Than Pesticides

A. Aliphatic Hydrocarbons
- Cyclohexane
- Dicyclopentadiene

B. Alkyl-Substituted Aromatic Hydrocarbons
- Ethylbenzene
- Styrene
- Toluene
- Xylenes

C. Ethers
- Dioxane
- Tetrahydrofuran

D. Halogenated Aliphatic Hydrocarbons
- Bromochloromethane
- Carbon Tetrachloride
- Chloroform
- Chloromethane
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- Dichloromethane
- 1,2-Dichloropropane
- Hexachloropentadiene
- Hexachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethylene
- Vinyl Chloride

E. Halogenated Aromatic Hydrocarbons
- Chlorobenzene
- o-Dichlorobenzene
- p-Dichlorobenzene

TABLE IX (Continued)

I. Organic Chemicals Other Than Pesticides (Continued)

F. Multifunctional and Miscellaneous Structural Types
4,4'Methylene-bis-2-chloroaniline (MOCA)
Nitrobenzene

II. Pesticides

A. Chlorinated Hydrocarbons
Aldrin
1,2-Dibromo-3-chloropropane (DBCP)
Endosulfan
Kepone
Toxaphene

B. Phenoxy Herbicides
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)
Silvex

C. Miscellaneous
2,4-Dinitrophenol

III. Petroleum Mixtures

Fuel oils and diesel
Jet fuel

IV. Inorganic Chemicals

Antimony
Barium
Cadmium
Copper
Fluoride
Lithium
Mercury
Palladium
Silver
Thallium
Vanadium

TABLE X

KNOWN CONTAMINANTS OF GROUNDWATER HAVING THE POTENTIAL TO CAUSE CENTRAL NERVOUS SYSTEM EFFECTS
(Taken from Table VI)

I. Organic Chemicals Other Than Pesticides

Aliphatic Hydrocarbons
- Cyclohexane
- Dicyclopentadiene

Aromatic Hydrocarbons
- Benzene

Alkyl-Substituted Aromatic Hydrocarbons
- Ethylbenzene
- Styrene
- Toluene
- 1,2,4-Trimethylbenzene
- Xylenes

Aliphatic Alcohols
- Methanol

Ethers
- Diethyl ether
- Tetrahydrofuran

Ketones
- Acetone

Carboxylic Acids
- Formic Acid

Halogenated Aliphatic Hydrocarbons
- Bromochloromethane
- Bromoform
- Carbon Tetrachloride
- Chloroform
- Chloromethane
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- Dichloromethane
- Hexachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethylene
- Trichlorofluoromethane
- Vinyl Chloride

TABLE X (Continued)

I. Organic Chemicals Other Than Pesticides (Continued)

Halogenated Aromatic Hydrocarbons
- Chlorobenzene
- o-Chlorotoluene
- o-Dichlorobenzene
- p-Dichlorobenzene

Aromatic Amines
- Aniline

Esters
- Dibutyl phthalate

Chlorophenols
- Pentachlorophenol

Multifunctional and Miscellaneous Structural Types
- Chlorinated dibenzo-p-dioxins
- Dodecyl mercaptan
- Nitrobenzene

II. Pesticides

Chlorinated Hydrocarbons
- Aldrin
- Chlordane
- DDT
- Dieldrin
- Endosulfan
- Endrin
- Toxaphene

Phenoxy Herbicides
- 2,4-Dichlorophenoxyacetic acid (2,4,-D)
- 2,4-Trichlorophenoxyacetic acid (2,4,5-T)
- Silvex

Other Herbicides
- Atrazine
- Bromacil
- Simazine

Miscellaneous
- 2,4-Dinitrophenol

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TABLE X (Continued)

III. Petroleum Mixtures

Gasolines
Fuel oils and diesel
Jet fuel

IV. Inorganic Chemicals

Cadmium
Cyanide
Fluoride
Lead
Lithium
Magnesium
Manganese
Mercury
Nickel
Selenium
Thallium
Vanadium

TABLE XI

CARCINOGENS IDENTIFIED IN GROUNDWATER

Only substances classified as carcinogens by the International Agency for Research on Cancer, the Department of Health and Human Services, and the Environmental Protection Agency are listed. In all cases, the evidence has been subjected to peer review.

I. Organic Chemicals Other Than Pesticides

Aromatic Hydrocarbons
- Benzene

Polynuclear Aromatic Hydrocarbons
- Anthracene
- Phenanthracene

Ethers
- Dioxane

Halogenated Aliphatic Hydrocarbons
- Carbon tetrachloride
- Chloroform
- 1,2-Dichloroethane
- 1,1-Dichloroethane
- Hexachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethylene
- Vinyl Chloride

Halogenated Aromatic Hydrocarbons
- Polychlorinated Biphenyls (PCBs)

Aromatic Amines
- Aniline
- Benzidine

Chlorophenols
- 1,4,6-Trichlorophenol

Esters
- Bis(2-ethylhexyl)phthalate

Multifunctional or Miscellaneous Structural Types
- Dichlorobenzidine
- 4,4-Methylene-bis-2-chloroaniline (MOCA)
- 2,3,7,8-Tetrachlorodibenzo-p-dioxin

TABLE XI (Continued)

II. Pesticides

Chlorinated Hydrocarbons
- Aldrin
- Chlorodane
- DDD
- DDT
- 1,2-Dibromo-3-chloropropane (DBCP)
- Dieldrin
- Heptachlor
- Kepone
- Toxaphene

III. Inorganic Chemicals

- Arsenic*
- Beryllium*
- Cadmium
- Chromium*
- Nickel*

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* May be carcinogenic only via inhalation, and in forms found in occupational settings.

TABLE XIV

SUBSTANCES KNOWN TO CONTAMINATE GROUNDWATER WITH LITTLE OR NO TOXICITY DATA AVAILABLE

In some cases, there were qualitative but no quantitative data.
See text for limitations in analysis.

I. Organic Compounds Other Than Pesticide

Aliphatic Hydrocarbons
- 1,3,5,7-Cyclooctatetraene
- Dicyclopentadiene
- 2,3-Dimethylhexane
- 4,6,8-Trimethyl-1-nonene
- Undecane
- Diesel fuel
- Jet fuel

Alkyl-Substituted Aromatic Hydrocarbons
- 1,2,4-Trimethylbenzene

Aliphatic Alcohols
- Benzyl alcohol
- 2,3-Dimethyl-3-hexanol
- 2-Propyl-1-heptanol

Phenols
- p-t-Butylphenol
- 2,6-Di-t-butyl-p-cresol
- p(2,2,3,3-Tetramethylbutyl)phenol

Ethers
- Butoxymethylbenzene

Halogenated Aliphatic Hydrocarbons
- Dibromochloromethane
- 1,6-Dichlor-1,5-cyclooctadiene
- Dichloropentadiene
- Hexachloropentadiene

Halogenated Aromatic Hydrocarbons
- p-Chlorotoluene
- Fluorobenzene

Multifunctional and Miscellaneous Structural Types
- N-(3-Methylphenyl)acetamide
- 1-Chloro-2,3-dichydro-1H-indene
- Chloromethyl sulfide (and oxidation products)
- 1,2-Dihydro-2,2,4-trimethylquinoline
- Dimethyldisulfide
- 2,6-Di-t-butyl-p-benzoquinone
- Dodecylmercaptan
- 1-Methylthiobenzylthiazole
- o-Nitroaniline

II. Pesticides

Although there are some pesticides for which little data appear in the public literature, EPA files presumably contain a great deal of toxicity data submitted by industrial firms.

III. Inorganic Chemicals

None

TABLE XV

Potential Groundwater Contaminants
Displaying Serious Forms of Toxicity

Compound or Class	Potential Effects
n-Hexane	Neurotoxicity
Phenols	Neurotoxicity and a variety of systemic effects
Methanol	Blindness; liver and kidney injury
Alkylamines and alkanolamines	Allergic sensitization. Liver and kidney injury. Potential to form carcinogenic N-nitrosomines
Dimethyl sulfate	Carcinogen; mutagen
Ethylene and propylene oxide	Suspect carcinogenicity; mutagenicity
Mercaptans	CNS depression; liver and kidney damage
Acrylonitrile	Carcinogenicity
N-Nitrosamines	Carcinogenicity
Carbon disulfide	Neurotoxicity
Alkyl lead compounds	Neurotoxicity; damage to kidneys and hematopoietic system
Toluene diisocyanate	Respiratory toxicant. Degrades to toluene diamine, a known carcinogen
Any pesticide	Wide variety of effects.

TABLE XIX

The EPA LIST OF PRIORITY POLLUANTS FOR WHICH AMBIENT WATER QUALITY CRITERIA ARE AVAILABLE

Pollutants are categorized according to the system used to categorize known groundwater contaminants (Table VI)

I. Organic Compounds Other than Pesticides

A. Aliphatic Hydrocarbons
- None

B. Aromatic Hydrocarbons
- Benzene

C. Polynuclear Aromatic Hydrocarbons
- Acenapthene
- Benzo(a)anthracene
- Benzo(a)pyrene
- 3,4-Benzofluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Acenapthylene
- Anthracene
- Benzo(ghi)perylene
- Fluorene
- Phenathrene
- Dibenzo(a,h)anthracene
- Indeno (1,2,3-cd)pyrene
- Pyrene

D. Alkyl-Substituted Aromatic Hydrocarbons
- Ethylbenzene
- Naphthalene
- Toluene

E. Aliphatic Alcohols
- None

F. Phenols
- 2,4-Dimethylphenol
- Phenol

G. Ethers
- None (but see haloethers, below)

H. Ketones
- None

I. Carboxylic acids
- None

TABLE XIX (Continued)

I. Organic Compounds Other than Pesticides (Continued)

J. Halogenated Aliphatic Hydrocarbons
- Bromoform (tribromomethane)
- Bromomethane
- Carbon tetrachloride
- Chloroform
- Chloromethane
- Chlorodibromomethane
- Chloroethane
- Dichloromethane
- Dichlorobromomethane
- Dichlorodifluoromethane
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- 1,2-Dichloroethylene
- 1,2-Dichloropropane
- 1,3-Dichloropropylene
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- Hexachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethylene
- Trichlorofluoromethane
- Vinyl Chloride (chloroethylene)

K. Halogenated Aromatic Hydrocarbons
- Chlorobenzene
- 2-Chloronapthalene
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- Hexachlorobenzene
- Polychlorinated biphenyls

L. Aromatic Amines
- Benzidene

M. Esters
- Bis(2-ethylhexyl) phthalate
- Butyl benzyl phthalate
- Di-n-butyl phthalate
- Di-n-octyl phthalate
- Diethyl phthalate
- Dimethyl phthalate

TABLE XIX (Continued)

N. Chlorophenols
- p-Chloro-m-cresol
- 2-Chlorophenol
- 2,4-Dichlorophenol
- 2,4,6-Trichlorophenol
- Pentachlorophenol

O. Multifunctional and Miscellaneous Structural Groups
- Acrolein
- Acrylonitrile
- Bis(chloromethyl)ether
- Bis(2-chloroethyl)ether
- Bis(2-chloroisopropyl)ether
- Bis(2-chloroethyoxy)ether
- 4-Bromopheynl phenyl ether
- 2-Chloroethyl vinyl ether
- 4-Chlorophenyl phenyl ether
- 3,3'-Dichlorobenzidine
- 2,6-Dinitro-o-cresol
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- 1,2-Diphenylhydrazine
- Isophorone
- Nitrobenzene
- 2-Nitrophenol
- 4-Nitrophenol
- N-Nitrosodimethylamine
- N-Nitrosodiphenylamine
- N-Nitrosodi-n-propylamine
- 2,3,7,8-Tetrachlorodibenzo-p-dioxin

II. Pesticides

A. Chlorinated Hydrocarbons
- Aldrin
- Chlordane
- DDT
- DDE
- DDD
- Dieldrin
- Endosulfan
- Endrin
- Endrin aldehyde
- Heptachlor
- Heptachlor
- Heptachlor epoxide
- Hexachlorocyclhexane (all isomers)
- Toxaphene

TABLE XIX (Continued)

B. Carbamates
None

C. Organophosphates
None

D. Phenoxyherbicides
None

E. Other Herbicides
None

F. Miscellaneous
2,4-Dinitrophenol

III. Inorganic Chemicals

Antimony
Asbestos
Beryllium
Cadmium
Chromium
Copper
Cyanide
Lead
Mercury
Nickel
Selenium
Silver
Thallim
Zinc

TABLE XVIII

Chemicals for Which There are EPA Health Advisories

Contaminant	Level (parts per million) One-Day	Ten-Day	Long-Term (1-2 years)
1,1,1-Trichlorethane	-	-	1.0
Trichloroethylene	2.0	0.2	0.735
Tetrachloroethylene	2.3	0.175	0.020
Kerosene (benzene, benzo(a)pyrene)	0.1	0.1	0.025
Xylenes	12	1.4	0.62
Cis-1,2-Dichloroehylene	4	0.4	-
Trans-1,2-Dichloroethylene	2.7	0.27	-
Ethylene glycol	19.0	5.5	5.5
Chlordane	0.063	0.063	0.008
1,2-Dichloroethane	Not Determined at this time		
Formaldehyde	0.030	0.030	-
Methylene chloride	13.0	1.3	0.15
Vinylidene chloride	1.0	0.07	0.07
Carbon tetrachloride	0.2	0.02	-
n-Hexane	13.0	4.0	-
Methyl ethyl ketone	7.5	0.75	-
HA's Under Consideration:			
Uranium	-	-	10 p^{ci}/L
Benzene	-	0.23	0.07
1,4-Dioxane (p-Dixoane)	5.68	0.568	-
Polychlorinated biphenyls	0.125	0.0125	-
Toluene	21.5	2.2	0.34
Dibromochloropropane			
1,2-Dichloropropane			
Gasoline			
Diesel oil			
Adicarb			
Carbofuran	0.100	0.100	0.005
Pentaclorophenol			
Dacthal			

TABLE XVII

Drinking Water Contaminants for Which There are Maximum Contaminant Levels or Health Advisories (40 CFR Part 141)

Contaminant	Level (mg/L)
Inorganic Chemicals:	
Arsenic	0.05
Barium	1
Cadmium	0.010
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10
Selenium	0.01
Silver	0.05
Fluoride	1.4 - 2.4
Organic Chemicals:	
Endrin	0.0002
Lindane	0.004
Methoxychlor	0.1
Toxaphene	0.005
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichlorophenoxy-propionic acid)	0.01

TABLE XX

Known Groundwater Contaminants For Which
There are No Ambient Water Quality Criteria,
EPA Health Advisories, or Maximum Contaminant Levels

I. Organic Compounds Other than Pesticides

A. Aliphatic Hydrocarbons
- Cyclohexane
- 1,3,5,7-Cyclooctatetraene
- Dicyclopentadiene
- 3,3-Dimethylhexane
- Propane
- 4,6,8-Trimethyl-1-nonene
- Undecane

B. Aromatic Hydrocarbons
- None

C. Polynuclear Aromatic Hydrocarbons
- None

D. Alkyl-Substituted Aromatic Hydrocarbons
- n-Propylbenzene
- Styrene (vinyl benzene)
- 1,2,4-Trimethylbenzene

E. Aliphatic Alcohols
- Benzyl alcohol
- 2,4-Dimethyl-3-hexanol
- Methanol
- 2-Propyl-1-heptanol

F. Phenols
- t-Butylphenol
- 2,6-Di-t-butyl-p-cresol
- p-(1,1,3,3-Tetramethylbutyl)phenol
- p-(2,2,3,3-Tetramethylbutyl)phenol

G. Ethers
- Diethyl ether
- Dioxane (no chronic value)
- Tetrahydrofuran

H. Ketones
- Acetone
- Benzophenone

I. Carboxylic Acids
- Acetic acid
- Formic acid

TABLE XX (Continued)

J. Halogenated Aliphatic Hydrocarbons
- Dibromodichloroethylene
- 1,6-Dichlor-1,5-cycloctadiene
- Dichloropentadiene

K. Halogenated Aromatic Hydrocarbons
- Bromobenzene
- o-Chlorotulene
- p-Chlorotoluene
- Fluorobenzene
- Polybrominated biphenyls (PBBs)

L. Aromatic Amines
- Aniline

M. Esters
- None

N. Chlorophenols
- None

O. Multifunctional and Miscellaneous Structural Groups
- Acetanilide
- Acetyl chloride
- Alkyl benzene sulfonates
- Alkyl sulfonates
- Butoxymethyl benzene
- 4,4'-Methylene-Bis-2-Chloroaniline (MOCA)
- N-(3-Methylphenyl)acetamide
- 1-Chloro-2,3-dihydro-1.h.-Indene
- Chlorophenylmethyl sulfide (sulfoxide and sulfone)
- 1,2-Dihydro-2,2,4-trimethylquinoline
- Dimethyldisulfide
- 2,6-Di-t-butyl-p-benzoquinone
- Fluorescein dye
- Laurylmercaptain
- 1-Methylthiobenzothiazole
- o-Nitroaniline
- Uracil

II. Pesticides

A. Chlorinated Hydrocarbons
- 1,2-Dichlorpropene
- Kepone

B. Carbamates
- None

TABLE XX (Continued)

C. Organophosphates
- Chloropyrifos
- Dichlorofenthion
- Parathion
- Phorate

D. Phenoxyherbicides
- None

E. Other Herbicides
- Atrazine
- Bromacil
- Prometon
- Simazine

F. Miscellaneous

III. Petroleum Products

- Jet fuel

IV. Inorganic Chemicals

- Aluminum
- Ammonia
- Boron
- Cobalt
- Disulfide
- Lithium
- Iron
- Manganese
- Nitrite
- Palladium
- Sulfide
- Thioryanate
- Titanium

Senator DURENBERGER. Dr. Cohen, your map of nitrate contamination was very interesting. I could see in my own State, the areas of the not-so-rich farmland, the pink one, they were pumping a lot of fertilizers into otherwise less productive soils.

I wonder if you would elaborate a little bit on whether we can draw some general conclusions about the occurrence of other types of agricultural contamination or other kinds of human contamination of the soil from that kind of a map.

Mr. COHEN. Certainly one needs to reflect on the host of other agricultural chemicals that generally are used coincidental with the application of fertilizers. It is quite common to apply fertilizers and pesticides to the same fields. So in areas of possible fertilizer contamination, one wonders and one is inclined to speculate there may well be significant contamination related to use of pesticides.

Similarly, in highly urbanized areas, New Jersey and Long Island, for example, the standard method of rehabilitating septic tanks and such facilities has been in the introduction of synthetic organic solvents—trichloroethylene, for example—so it is not uncommon to find the components of sewage along with organic solvents in ground water because the two have been used hand in hand.

Senator DURENBERGER. Where are the nitrates coming from in Yellowstone or Glacier Parks?

Mr. COHEN. There are a number of interesting spots on the map. The Yellowstone Park nitrates reflect these nitrogen levels in three counties. In two of the counties it is probably agriculture. In the third, Yellowstone Park is located.

This is a point I should have made. The types of investigations that we have been involved in generally are in areas where people are concerned. Now, in the Yellowstone Park area, there has been concern by the Park Service in terms of how they dispose of visitor wastes. The sewage has been disposed of in the past in sewage disposal ponds. We have constructed some observation wells near the ponds, and not to our surprise, those observation wells contain sewage-related contaminants. So there is some bias towards problems in this presentation, and that is what you are seeing in Yellowstone Park.

Senator DURENBERGER. I think I was about 14 years old when I discovered that my grandmother had a rare talent, that she could walk through the yard with a willow switch and discover artesian wells and make water flow from the ground. I have always admired my grandmother for that.

As I became older, I discovered other people could do that. In fact, I could do it myself. We have an artesian well that has been flowing for, I guess, 36 years. The water, clear, cool, and pure, except for iron, flows out into a lake.

How much of that is still going on in this country?

Mr. COHEN. Generally, over the past two or three decades, States have become more and more interested, especially in the Western part of the United States, in regulating uncontrolled flows of artesian wells, so they have been shutting artesian wells down. But there are still many artesian wells flowing freely right now.

From one point of view that can be viewed as a waste of water. I suspect a major problem is that there are many artesian wells that

are now buried and one cannot observe the artesian flow. You can visualize a pipe extending 100 feet into the ground, the water coming up the pipe, the pipe is now corroded and eroded, and water is leaking out at a depth of 5 to 10 feet from the surface. That is ground water being lost without being observed generally. If one is sensitive to this, you can see willows and the like growing in these areas. They are simply feeding on that water. The terminology we use is they are phreatophytes. So, they are consuming and wasting ground water.

More and more of it is being regulated, but there is a lot going on.

Senator DURENBERGER. Let me explore with you the suggestions in your statement on better data collection terminology and enhancing that effort. Are you suggesting we need to establish a central data collection area, and a monitoring capability for that data?

Mr. COHEN. I think both of those and a number of other things. I think what the Nation needs is some approach to a national water-quality assessment system in which the activities of all of the public and private agencies associated with the collection of water samples and the analysis of these samples are somehow brought together into a cohesive single set of activities.

It is a massive undertaking. An attempt to look for a single set of pesticides in a portion of the country in which those pesticides are being used would be terribly, terribly expensive. One runs into all sorts of issues, including regulatory and legal; as to who is going to collect these samples, and why, and how they are going to be collected. Somehow we think a process must be developed by the way this information is standardized to the extent possible and made readily available so that syntheses of this type can be made so that people like myself don't come to this committee 10 years from now and say yes, we spent several hundreds of millions of dollars of public funds and we do not have the ability to bring that information together and bring answers to you as to whether contamination is getting worse or better or, as a matter of fact, where it is.

Senator DURENBERGER. Does USGS have the capability, if it had the charge and resources, to work with EPA in developing monitoring protocols?

Mr. COHEN. We certainly do, yes. As a matter of fact, we do a lot of work in cooperation with EPA in a formal sense. But I think in terms of the scale of the program, from a national scope, I think it is fair to say that both EPA and USGS are sort of just nibbling at the fringes.

We are spending a lot of money at USGS. We are probably spending on the order of $100 million a year nibbling at the fringes in part because of the nature of our program.

One component of our program, formally described in the budget process, is our Federal-State cooperative program. At the present time, $50 million is appropriated to the Geological Survey with the stipulation those moneys be used to match State and local moneys. This is one of the few cases in which the funds flow from the State and local agencies, some 900, to the Federal Government and we do the work. By the nature of those interactions, the work is very unevenly distributed areawide. In heavily populated States, such as New York and New Jersey, where we have massive programs, we

can tell you a great deal about ground water contamination. On the other hand, there are many States in the country in which we are doing very little work on ground water contamination.

Although I would describe that program as a nationwide program, and it is one that is very valuable, it is not a national program.

Senator DURENBERGER. Would you have any inclination to support some kind of a national monitoring network like we have for surface waters? I hear it costs an awful lot of money. I wondered whether it wouldn't be better to put that money into implementing protection rather than putting it into monitoring. But maybe you have a different view.

Mr. COHEN. To the best of my knowledge, there are only two national water-quality monitoring networks that are now being operated on a consistent basis throughout the United States. Those are both operated by the Geological Survey. They are surface-water networks.

Many, many activities are being done by many States, but in terms of a coherent network in which there is a fixed set of stations used, fixed protocols and fixed analytical techniques, there are only two, and they are very small. They give you a coarse overview of surface water, but they really aren't giving us the picture that many people would hope for.

The approach with ground water is far more complex. The requirements for monitoring ground water are far more complex than for surface water because of some of the reasons I alluded to in my earlier remarks.

Again, based upon our experience in terms of monitoring surface water, we are somewhat reluctant to propose fixed station monitoring of ground water throughout the United States. First of all, it would involve an extremely expensive set of activities. Second, we are dealing with a three-dimensional problem as opposed to largely a one-dimensional problem in streams and perhaps two-dimensional in lakes. We are dealing with a completely different timeframe in terms of the rate of movement of ground water.

If you recall the diagram in which I showed several plumes, one can randomly drill wells in that type of terrain and miss the contaminated zone more often than not. The approach we advocate is a systematic, continuing analysis of the ground water resources of the United States with emphasis on understanding the hydrogeology, the flow systems, the movement of contaminants, and on that basis the installation of highly selected observation wells, setting up hypotheses, installing observation wells, and making very infrequent measurements—much more infrequent than that required for surface water, because of the slow flow rates of ground water.

Yes, a national ground water analysis program is needed, but I hesitate to use the word monitoring because that brings to mind a large network of fixed-station, fixed-point measurements. That really is probably not feasible for ground water.

Senator DURENBERGER. Mr. Rodricks, if you would excuse me for 1 minute, I will be right back.

[Brief recess.]

Senator DURENBERGER. Mr. Rodricks, you have a list attached to your testimony of known and potential ground water contami-

nants. I wonder if you would identify for us the sources of that information, whether this was a survey undertaken expressly for your study or it was drawn from other existing water quality surveys.

Mr. RODRICKS. The list of chemicals was provided to us by the Office of Technology Assessment. They collected it from some other contractors during the course of their developing the report on ground water contaminants. Then they asked us to look at this list, to look at data on levels that had been reported, the number of times particular contaminants had been reported, things of that sort, to see whether we could make anything of it on a national basis. We could not. But we did think the kind of discussion we presented here, with the qualifications attached, was a useful way to organize existing but very, very limited data.

Senator DURENBERGER. There is an impressive number of substances on the list. What would your opinion be as to the impact on EPA and at least their current resources if they were required to start setting limits or criteria for all of the substances or most of the substances on that list?

Mr. RODRICKS. First, just to be sure we understand, many of these substances perhaps occur quite infrequently. We are not entirely sure which fall in that category. There is some uncertainty about that. So it may not be necessary to consider standard setting for everything on the list. I think a more careful review of the pervasiveness of these materials would perhaps be in order.

Senator DURENBERGER. Is everything on the list?

Mr. RODRICKS. Everything we know of that has been detected in ground water. We believe that there are perhaps other materials likely to contaminate ground water but for which a search has not yet been made, and we also have a list of these.

With regard to EPA's resources, I mentioned the ambient water quality documents simply because they cover a fairly large fraction of these contaminants. They cover the priority pollutants, of course. One of the reasons why priority pollutants appear, I think, is that those are the pollutants for which we have analytical methods available. So that sort of bias is in those data. Our firm and many others use water quality criteria documents frequently, although we recognize they are out of date and certainly need to be updated. I think it would take a substantial resource to simply update those. There are over 100 chemicals covered by the criteria, and there are probably another 50 or 75 chemicals for which similar documentation ought to be brought together. That is a very substantial effort.

Senator DURENBERGER. You state in your testimony that limits on human exposure need to be established for most contaminants based, at least in part, on toxicological properties. You also indicate that EPA's ambient water quality criteria developed under the Clean Water Act appear to be of greatest potential utility in establishing such limits on human exposure.

Could you elaborate on their utility and your concerns about the application of standards developed under the Safe Drinking Water Act and others?

Mr. RODRICKS. The criteria are only that, as I understand it. They are not standards. But they do define the level of health pro-

tection associated with various levels of contamination and suggest how health might be protected by providing adequate safety margins for most toxic effects.

They seem to be of greatest utility in that there is a large number of them and they cover a large fraction of the materials present in ground water. They are based purely on health considerations. They do not take into account cost or technological capabilities.

Now, if health protection is the only criterion, then they would seem to be of great utility. We also caution that standards developed in other contexts, maximum contaminant levels, for example, are based on criteria other than pure health protection.

For that reason, it might not be appropriate simply to adopt such standards for ground water contaminants, and we urge some caution in that regard.

Senator DURENBERGER. Gentlemen, I thank you very, very much for your testimony and for your responses to our questions. I am sure we are goinq to see more of you during the coming months. Thank you.

Our next panel consists of Mr. Alvin Alm, former Deputy Administrator of the Environmental Protection Agency, presently senior advisor, Clean Sites, Inc.; Ms. Paula Stone, Ph.D., Groundwater Project Director, Office of Technology Assessment; and Mr. Edwin Clark, Ph.D., senior associate, the Conservation Foundation, Washington, DC.

Thank you very much, all of you, for coming here and for your commitment to helping us in the process of laying a foundation for a ground water strategy. Your statements will all be made part of the record today. You may proceed to summarize them in whichever way you would feel would be most appropriate.

Al, I guess you are first on the list.

STATEMENT OF ALVIN ALM, FORMER DEPUTY ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY, PRESENTLY SENIOR ADVISOR, CLEAN SITES, INC.

Mr. ALM. Thank you, Mr. Chairman. In trying to get through this thing quickly, I think I will read it rather than try and summarize it, in which case I would probably take more time.

I am delighted to testify as a private citizen, unencumbered by either program responsibility or the need to conform any of my views to higher authority. Although somewhat liberated, I am afraid my views haven't changed much, which may indicate that I lack imagination.

I would say at the outset that the ground water problem is substantially more complicated to deal with than any other environmental problem that I ever encountered at EPA or in prior agencies that I have served in. It differs substantially from conventional air and water pollution. For one thing, ground water contamination results generally from inadvertent release of materials from an incredibly wide variety of sources. Air and water emissions or effluents, on the other hand, are deliberately released into the environment under controlled conditions, and these conditions are controlled by emission or effluent and ambient standards. The

number of sources in air and water pollution, with the exclusion of nonpoint sources, is much, much smaller. So the regulatory universe is greater.

Ground water is difficult to monitor. We have talked about that. It recovers slowly. It moves slowly in complex underground formations, and it is very costly to clean up. A great deal of the ground water is not in a pristine state but is highly saline and, hence, unusable. Because of these differences, ground water control efforts cannot easily mirror those of conventional air and water pollution.

The management problems arise from these differences and from the lack of institutional capacity to cope with ground water problems. Congress has enacted a number of laws. I needn't go through these with you, Mr. Chairman. Some of them you have taken leadership on, such as the legislation recently for leaking underground storage tanks.

But the Federal coverage is only partial. There is a great deal of ground water problems that are not covered at all by the Federal authorities. States still retain responsibility for regulating any discharges from septic tanks, fertilizer—which we have talked about this morning—road deicing salts, municipal landfills, and other diverse resources. In essence, we have a regulatory patchwork that is divided between direct federally operated programs, Federal programs delegated to the States, and programs administered exclusively by the States.

This is about as complicated a mess as I can think of in any of the environmental management efforts under way.

With this context in mind, I would like to suggest three major program issues that any comprehensive approach to ground water protection must encompass.

First, what set of program objectives can both guide Federal program activities and provide a framework for State programs?

Second, what should the Federal Government do to develop capacity at the State level to cope with ground water problems?

And third, how can this welter of Federal and State programs be operated in a coherent fashion?

Now, one option, of course, is to draft a comprehensive strategy that would basically redo or make all the existing laws conform to it. Mainly it would require, I would think, massive changes in RCRA, Superfund, and the like.

I am going to address my comments to a more modest set of potential proposals which would assume that the current legislation stays in effect. You might have, for example, a ground water policy and you might have measures to deal with State programs, although ultimately I conclude legislation is not desirable at this time.

On the first issue, I believe, not surprisingly, that the goals of EPA's ground water strategy make sense. That policy, which provides differential protection depending on the value of the resource, provides a useful framework for decisions on EPA's own program and a policy framework for integrating Federal and State programs. The policy has been particularly useful in stimulating greater effort to control harmful pesticides that can leak into ground water. Its utility, however, is limited by the fact that EPA's

statutes affecting ground water restrict full flexibility to implement the strategy.

Moving to the second issue, I believe developing State capacity to cope with ground water problems is the most important challenge in dealing with ground water. This cannot be accomplished simply by legislative edict. It took decades to develop the State and local programs in air and water pollution. Specialized training in certain disciplines, such as sanitary engineering, chemical engineering, and meteorology, coupled with conceptual agreement on concepts such as secondary treatment, all helped create an infrastructure at the State and local level to manage environmental problems. For ground water, you don't have the same conceptual basis. You don't have the trained expertise, technical expertise, in areas such as hydrogeology, soil sciences, and microbiology.

It is obviously tempting to establish Federal requirements for ground water programs similar to those in other media. Unfortunately, the base for these other programs took years to develop and, indeed, States led the Federal Government in many areas, such as use of permit systems. Because ground water contamination has no long history, in terms of public concern and establishment of State programs, there is no infrastructure to build on.

Moreover, I doubt that there is any consensus on what a perfect State ground water program should encompass. Should State permits be given for all activities that affect ground water? Should States classify all their aquifers? Is sophisticated planning a diversion from getting something done? Or is the rush to action, without adequate planning, only going to result in wasted motion? We simply do not know enough to answer these questions.

Over time, I think some needed elements for State programs will emerge. Some I think are obvious now. I think that State ground water programs must be administered by one agency to be effective. There is no way in the world that three agencies can effectively implement a ground water program at the State level. Some form of classification or priority setting will be necessary on a comprehensive basis. Permit and regulatory authority will be necessary to enforce compliance. Technical expertise will be necessary to administer these programs effectively.

There are a number of things the Federal Government can do to stimulate strong State programs. Currently $7 million of Federal grants are available to the States to assist them in establishing and operating ground water programs. Federal technical assistance and research, provided by both the Geological Survey and EPA, are also helpful. The States are particularly concerned about more drinking water standards, which they think are critical to operating their ground water programs. Vigilant Federal implementation of the pesticide law is very important.

In my opinion, these series of actions are the most important steps the Federal Government can take to help States develop and implement effective ground water programs.

The final question is how to bring some coherence to both the Federal and State ground water efforts. As mentioned earlier, the ground water strategy moves in that direction, but is limited by the rigidities in a number of different laws that affect ground water. Hence, for the same aquifer, some resources of contamination will

be tightly controlled by Federal law while others are uncontrolled or inadequately controlled.

Barring enactment of some comprehensive Federal legislation, the States will ultimately need to provide coordination of ground water programs. The only real option is Federal legislation that covers all forms of ground water contamination, from pervasive sources such as septic tanks to localized sources such as road deicing salts.

Since such legislation is both improbable and I would think undesirable, States will ultimately need to develop programs that can identify ground water problems and take appropriate regulatory steps to bring them under control. Some sources will be controlled under Federal laws, such as RCRA and Superfund, and others under State law. But only through focusing on ground water as a resource can we bring coherence out of the current patchwork of Federal and State laws.

I conclude with my impressions of what Congress can do at this point. In my opinion, new Federal legislation would probably be premature and potentially counterproductive. I do believe that congressional oversight can be very helpful in pushing both the Federal Government and the States to deal more effectively with ground water problems. However, if the committee feels differently, that legislation is appropriate, I would certainly be happy to work with them in any way that would be helpful.

This concludes my testimony. I will be pleased to answer any questions that you or members of the committee may have.

Senator DURENBERGER. Thank you very much.

Paula?

STATEMENT OF PAULA STONE, GROUND WATER PROJECT DIRECTOR, OFFICE OF TECHNOLOGY ASSESSMENT

Dr. STONE. Thank you, Mr. Chairman, members of the subcommittee. I plan to summarize my statement for you this morning.

My statement responds to your request for an overview of the Nation's ground water contamination problems based on OTA's study "Protecting the Nation's Groundwater From Contamination," which was requested by the full Committee on Environment and Public Works and was released by the committee last October.

The objective of this report is to assess the current status of the Nation's knowledge about and experience in dealing with ground water contamination problems.

There are essentially three key themes of the OTA report. First, while there are many aspects of ground water contamination problems that are not well understood scientifically and that are not well documented, still we have tried in our report to emphasize how much is now known about the problem.

For example, we have been able to document 33 very diverse types of sources that are known to be contaminating ground water. We have been able to document over 200 contaminants that have already been detected in the resource, including over 150 organic chemicals. And while definitive evidence for human health effects is not now available, still OTA's analysis has been able to link 24 potential adverse effects to these contaminants, the most serious

ones being damage to the kidney, liver, and central nervous system and cancers.

The second major theme of the report: OTA characterizes the concept of protecting ground water as involving a balancing among activities to detect, correct, and prevent ground water contamination problems. Depending on site conditions, one or more of these activities will need to be considered and may be required.

However, there will be no technology fix. Techniques for conducting detection activities, for example, are expensive. Options for corrective action not only are costly but their effectiveness is not proven. And successful application of all techniques will depend on the ability of trained personnel to tailor them to site-specific conditions. Indeed, the site-specific nature of ground water contamination problems is emphasized throughout the report.

Third, while Federal and State efforts have made important contributions to protecting the ground water resource, still OTA has been able to document how limited these efforts are in their ability to protect ground water from contamination. Just a few examples:

There is no explicit national legislative mandate to protect ground water quality.

With respect to sources, we have been focusing at the Federal level and, in turn, at the State level on a very important source of ground water contamination problems, that is, point sources associated with hazardous wastes. We have not, however, generally covered those sources that are nonpoint in nature, those sources associated with nonhazardous wastes, and those sources associated with nonwaste products.

There are only 22 mandatory Federal water quality standards established under the national interim drinking water regulations of the Safe Drinking Water Act. Of these 22, only 7 are for organic chemicals. Over 150 organic chemicals have already been found in ground water.

The final point I would make on this is that Federal and State laws and programs address public water supply systems. Yet we know there are an estimated 12 to 14 million private wells in this country serving perhaps as much as 25 percent of the population for which there is no routine required monitoring.

Having identified the three themes of the OTA report, what then are the implications for national policy? I think it is critical to remember that to address any policy question will require the commitment of a tremendous amount of what are already scarce resources in terms of people, in terms of time, and in terms of money. And even if we make the commitment to try to resolve some of these policy questions, we may still not be able to obtain the answers we had hoped for because there will always be some uncertainty associated with a problem that cannot be observed directly. Thus, the national policy challenges that we choose to pursue must be selected carefully to ensure that we receive the maximum returns for the resources that we commit.

From this perspective, then, the decision to go forward to try to answer certain policy questions would involve asking the following type of question, and that is, is the information that we would obtain from further study and analysis, is it really likely to buy us anything, buy us anything in terms of convincing us any better

that we have to act, directing us to do anything differently, or enabling us to address the problem any better at the site level than we could already do today based on what we already know?

Using this type of questioning, we have been able in our report to identify what we think are three key policy issues that would need to be addressed and that we believe could fundamentally change the way the Nation now perceives and addresses its ground water contamination problems.

The first would involve a focus on the ground water resource itself and on the interactions between ground water and other environmental media. Such a focus would involve addressing the breadth and diversity of sources that we know have the potential to affect ground water. And it would involve broadening legislative vision away from the traditional source-by-source approach that we have been taking to recognize that contaminants flow throughout society, to recognize the relationships among recharge areas, land use, and ground water quality, and finally to recognize the interaction between both ground water and surface water quality and quantity.

The second key policy issue that arises would be implementing and expanding programs to cover those sources of contaminants and users that are not now being covered.

The consequence of not doing this is well illustrated by the issue of standards. Because States perceive a virtual absence of Federal guidance in this area, they are going out and setting their own standards. What we find, however, is that different States are setting standards for different substances, and, in some cases, different States are setting different standards for the same substances.

Thus, related policy questions that will need to be faced will be: To what extent do we care about these discrepancies and will we want to reconcile at the national level the fact that different States are making different amounts of progress in their programs and that, in turn, the citizens of different States may be receiving different levels of protection.

The third key policy issue that we have identified relates to providing adequate, sustained, and flexible Federal support to the States. Because of the site-specific nature of ground water contamination problems, and because of the variations among States in terms of their priorities, their capabilities, their institutions, and stages of their program development, it will be the States in the end who will need to choose among, design, and implement their detection, correction, and prevention activities. Nevertheless, the provision of systematic Federal support to the States is possible because problems among the States do share certain commonalities. The Federal Government is in a unique position to mobilize and provide efficiently the information, guidance, and resources that are required by all States to address these common elements.

We have identified three key areas for Federal support in the work that we have done. They involve technical assistance, and by this I mean such things as training and education, criteria and guidelines development, and information exchange. A second area is in the area of funding. And finally, research and development.

Now, having identified the key policy challenges—this notion of focusing on the resource itself, expanding and implementing pro-

grams, as well as providing support to the States—what are the principal legislative options for meeting these challenges?

We perceive there to be three general legislative options. The first is to base further policy development on the existing legislative framework. Second would be to develop specific ground water protection legislation. The third option would be to rely on administrative initiative.

I would stress that since any of these approaches would be designed to meet the three policy challenges that I mentioned earlier, the choice of a legislative approach would represent more a difference in emphasis, based on the practical difficulties of implementing that legislative option, than necessarily a major difference in content. In the end, it may be that some combination of all legislative options will ultimately be the preferred choice, with the advantages of each approach being taken into account.

For example, the principal advantage of basing further policy development on the existing legislative framework would be that it embodies incremental adjustments along established policy precedents. It focuses on the implementation and enforcement of existing provisions.

But perhaps one of the key disadvantages of this option is that it need not directly and systematically address gaps and inconsistencies in the existing legislative framework.

Perhaps one of the key advantages of developing specific ground water protection legislation is its ability to facilitate directly a comprehensive, coherent, and consistent approach to ground water contamination problems. It also formally recognizes the nationwide dimensions of the problem. And it could formally broaden legislative vision away from the traditional source-by-source approach to contamination, while still incorporating those elements.

Perhaps one of the key disadvantages of this approach is that comprehensive environmental legislation has historically been suspect of trying to alter traditional governmental relationships for managing land use and water rights.

The third option, reliance on administrative initiative, implies minimal changes to the existing legislative framework and, therefore, removes pressure from the reauthorization process.

However, it is important to note that agencies are mission oriented and agency objectives and constraints are likely to drive administrative programs, not necessarily with the comprehensive vision that is required.

Senator DURENBERGER. Speaking of mission orientation, are you right at the end, because I think we have been at this about 13, 14 minutes now.

Dr. STONE. Yes.

In that sense, I know you will be discussing the EPA strategy later on in the hearings, and I would only observe how important it is that the strategy does recognize that ground water deserves a comprehensive approach, but still, the strategy does not provide for it.

I would conclude here by raising the question: How are we going to know when we are successful at dealing with the problem? In this respect, I would say that the answer to that is going to be complex. We are only finding what we are looking for. We have heard

this morning about the bias inherent in detection techniques, and that quantitative estimates of the problem would be prohibitively expensive and time consuming to develop.

I think the answer is going to require that we develop a realistic expectation about what we can achieve and that we assume responsibility for sources of contamination and contaminants so we can build a trust and confidence in our environmental future.

Senator DURENBERGER. Thank you very much.

Mr. Clark?

STATEMENT OF EDWIN CLARK, SENIOR ASSOCIATE, THE CONSERVATION FOUNDATION

Mr. CLARK. Thank you, Mr. Chairman.

As I believe you are aware, the Conservation Foundation, in cooperation with the National Governors Association, is sponsoring a National Ground Water Policy Forum which is attempting to deal with many of the policy issues you listed this morning. Among other things, this forum, which is chaired by Gov. Bruce Babbitt of Arizona, is attempting to define the elements of a truly adequate ground water protection program, giving particular attention to the allocation of responsibility for various components of the program among different levels of government.

Although it is too early for me to report on the ultimate conclusions and recommendations of the forum, I appreciate the opportunity to share with you some of our thoughts on major policy issues.

For this discussion I would like to focus on six major elements of a comprehensive policy. These six elements are: First, defining the goal of the ground water protection program; second, controlling potential sources of contamination; third, instituting programs to manage the ground water resource itself; fourth, determining what sanctions, incentives and enforcement mechanisms will be included in any program; fifth, determining what efforts should be made to clean up ground water that has already been contaminated, and sixth, instituting adequate monitoring and research programs.

Many of the difficult policy issues related to each of these elements will necessarily have to be resolved at the State or local level. Today, however, I would like to focus on possible Federal roles and on some specific policy questions Congress will have to address if it is going to attempt to formulate a comprehensive ground water protection statute.

Let me first identify what I see to be the general issues Congress must address with respect to each of these elements.

Establishing a goal. The basic question here is whether Congress should establish a national goal for ground-water quality; and, if so, what that goal should be and how it should influence the actual implementation of any program. I will come back to that question.

The second element is controlling potential sources of contamination. As Dr. Stone mentioned, there are many sources that are now uncontrolled, so the question is: Should the Federal Government take action to control these sources that are not being adequately addressed under current statutes? If so, how should the responsibility for controls be divided among Federal, State and local govern-

ments, and what types of controls are likely to be most effective and efficient?

The third element is managing the resource. Again, we have heard some comments on that this morning. Should Federal involvement extend into establishing procedures for managing as opposed to just protecting the ground water resource? If so, how far should the Federal Government go?

The other elements—sanctions, incentives and enforcement, remedial actions, and research and monitoring—are part of any Federal program and they raise issues that you have had to deal with often.

Finally, of course, there is the question of how much money the Federal Government should appropriate to implement any program. I am not in a position to comment on that question now.

Let me look at some specific questions.

Establishing a goal: Government environmental programs typically seem to contain two types of goals. In some cases the goal is an operational goal that directly determines what actions are taken and what standards are established. In other cases the goal is more of a hortatory goal, defining what we are ultimately aiming for, even though we may never reach it. The Clean Water Act contains one of each. The "fishable, swimmable" goal has had a direct impact on water quality standards. The "zero discharge" goal has had less of a direct impact, but still serves a hortatory purpose, providing a rough guide for the general direction the program should follow.

Thus, there are two questions involved in establishing a goal. The first is: Should it be operational or hortatory? The second is: What should that goal be?

The Environmental and Energy Study Institute issued a report which dealt with some of these issues, as did EPA's original ground-water policy, the draft of which was issued in 1980.

Currently, there seems to be increasing support for the nondegradation goal, and it has already been adopted in some States: For instance, Wisconsin, Maine, and Montana. Such a goal has several operational problems, however. In some cases its meaning is not clear. For instance, does the addition of clean water to an already polluted aquifer constitute degradation? If not, the term needs to be defined to mean something other than just a change from the current situation.

Moreover, how meaningful is a nondegradation goal if all potential sources of contamination are not being controlled? This is one of the problems discovered in the States that have adopted that goal.

Finally, how does one enforce a nondegradation goal? To do so would require knowledge of the uncontaminated quality of all ground water, something that we do not know and are practically unable to determine, as Dr. Cohen suggested. For these and other reasons, nondegradation would perforce have to be considered a hortatory, not an operational, goal, but still might serve some very useful purposes.

Controlling additional sources of contamination. In its excellent report which Dr. Stone just summarized, OTA identified a wide range of potential sources of ground water contamination. Most of

those are currently subject to few, if any, controls at the Federal, State or local level, even though some are known to be causing widespread contamination.

What role should the Federal Government be playing in attempts to control these sources? Many would seem to be primarily the responsibility of State and local government.

For instance, with sources such as septic tanks, there appears to be very little the Federal Government could do to impose controls. And sources such as irrigation seepage and mining may only pose threats in certain parts of the country, making national standards perhaps less appropriate. In these cases the question becomes whether the Federal Government should attempt to force State and local governments to take action; and, if so, how?

For those sources that might be controlled, at least in part, under Federal legislation, the question becomes whether the controls should be implemented under the patchwork of existing statutes or whether a new, complex, and possibly duplicative regula tory program should be developed. Here pesticides and fertilizers provide contrasting examples, one which probably has adequate regulatory authority for controlling it and the other which has none.

Is there any way, assuming that you are going to adopt different programs for different types of contaminants, to ensure these controls are being implemented in a coherent and consistent manner? I think that is probably a basic question that is going to be faced by any ground water protection statute.

The final policy question in controlling inadequately addressed sources is what kinds of controls should be implemented? Here you get the contrast between source controls and land use controls. Land use controls are probably necessary in some cases, and in most cases you will want a combination of the two.

But the most desirable combination will vary from one type of source to another and from one part of the country to another.

What role is the Federal Government going to have to create the proper incentive to force States or localities to take these protective actions?

Managing the resource: Past Federal efforts have tended to focus primarily on what the goal of the program should be and what measures should be taken to prevent contamination from various sources, placing relatively little emphasis on how the resource itself should be managed. I think Dr. Stone referred to this well in her testimony.

A comprehensive ground water resource management program would have to include a number of elements. Let me comment on a couple of them.

One is an operational plan to determine how the resource is to be used. So far the only element of this plan that has been proposed at the Federal level is an aquifer classification system. But EPA's proposed classification system provides only a hesitant start toward a true resource management approach. It is a reactive, not an anticipatory, program.

Classification decisions are made only after someone proposes to site a facility over which EPA has some control. It would seem to be much more efficient and effective to classify aquifers and their

recharge areas in advance to provide guidelines for better planning and more rational development patterns. EPA probably does not now have the authority to require states to undertake such a classification program. Should Congress make it a component of any new ground water protection initiative, or ought this to be within the discretion of the States?

The debates over EPA's classification proposals have raised a whole series of other issues that Congress may want to address. Fundamental to all of these is the role that a ground water classification scheme should play in managing the resource.

Some, and I heard a hint of this in your introductory remarks, have expressed serious misgivings about the whole concept of aquifer classification, fearing that it allows large areas to be written off as dumps for civilization's wastes. But aquifer classification should not be considered an end in itself; it is only a tool that should be used in implementing a comprehensive protection and management program and in setting priorities. If the resource is to be managed in an effective manner, there is probably no alternative to an aquifer classification scheme, but establishing such a scheme is not the same as establishing a management program.

A major purpose of an aquifer classification system is to define what source and land use controls should be implemented in different ground water recharge areas. Once this link is made, the question arises whether it is also necessary to establish ambient ground water standards for the different classes.

I would agree that ambient standards by themselves will not do the job. But I think in many cases they are important because even where they are not required by State law, they can be very useful in providing a clear touchstone for determining when there is a problem. Without quantitative standards, it becomes very difficult to judge when any contamination is sufficiently serious to require action.

If there are to be standards, the question becomes who should set them and whether they should be uniform across the country. Attempting to implement uniform national standards would create a number of difficulties. On the other hand, having each State attempt to proceed independently through the standard setting process, as they are now, is, at best, very inefficient.

The question is whether the Federal Government can contribute to this process in such a way to facilitate the States' efforts to set standards while allowing them the necessary flexibility to relate these standards to local conditions?

Dr. Cohen and Dr. Stone have both mentioned what I see to be two of the most difficult policy issues related to managing the resource, and that is integrating management of ground water quality with management of ground water quantity. Ground water quantity is, of course, extremely important both in protecting against contamination and in managing the resource, but it is an issue that has been clearly a State responsibility and one which Congress should address only with the greatest sensitivity and diplomacy, if at all.

You have similar questions, although less difficult perhaps, in terms of coordinating ground water quality with surface water quality.

These are only some of the issues Congress will have to address as it considers the need for a comprehensive protection program. They and others are being addressed by the National Ground Water Policy Forum. Although I cannot at this time indicate what the conclusions and recommendations of the forum may be, I believe that they will be available in time to assist the Senate in its deliberations. In the meantime, we will continue to keep your staff informed of how our efforts progress, and we would be delighted to receive any insights you may have on these issues.

I thank you again for the opportunity to share these thoughts with you today and would be happy to answer any questions.

Senator DURENBERGER. Very good. Thank you all very much.

Let me ask you a couple of questions and then I will submit some others for you to respond to, questions that address most of the six points I made in my opening statement.

My first suggestion was protecting human health, on the theory that half of the population depends on ground water for drinking water supplies. If we put a lot of emphasis on that, then we probably ought to also put most of our resources into detection and monitoring, on the theory it is only when a problem shows up at the tap or the well that we really have to take action.

On the other hand, we might define the goal as protecting the resource, whatever its current use might be. In that case, we would be putting our resources largely into preventing contamination.

So if I could ask each of you whether you think ground water is an issue of public health or is it an issue of resource protection, and ask you to try not to say it is both. That is too easy.

Al, are you going to be first?

Mr. ALM. You are saying I can't say both. I think the major objective has to be to protect the resource. Obviously, human health is the main concern, but there are other concerns that will drive any ground water policy. So I think you have to focus on the value of the resource itself.

Dr. STONE. I think I would agree with that, that what would come first would be resource protection, and from that would flow benefits to public health. I would also point out that there are other costs associated with contamination, including economic, environmental, and social costs, which we have not been discussing today. I would see resource protection coming first.

Mr. CLARK. I would concur with both Al and Paula.

Senator DURENBERGER. The second one is the theory of nondegradation. Again we can start with Al, but I think he has already spoken to it. He has said nondegradation as a strategy here is virtually impossible. The alternative to that is differential protection, I guess.

I wonder if any of you want to comment on that issue. We don't have nondegradation, as I understand it, in current law. We have the underground injection program, which permits intentional releases. We have encouraged pesticide applications and the operation of septic systems, which are certainly intentional releases.

Do you want to comment on that and then tell me how a nondegradation goal would affect current releases if nondegradation was one of our goals?

Mr. ALM. I would like to be last this time, if I could.

Mr. CLARK. I don't see quite the difference that you lay out there. I think even if you adopted a nondegradation goal, which as I said in my testimony I would see as primarily a hortatory goal, providing a useful though distant goal for us to attain, that you would probably implement it as we have the PSD regulations under the Air Act. That is, you would have some aquifers in which you did not want any degradation to occur, some in which you would allow a little, and some in which you perhaps would allow more. So I do not necessarily see a nondegradation goal in terms of being practically implemented as one that necessarily means the same protection everywhere.

Senator DURENBERGER. Do you have a handy list in your head of criteria for deciding which aquifers we will protect and which ones we won't?

Mr. CLARK. I have become increasingly impressed by the difficulty of trying to do that from Washington. I think that the definition of aquifers and classification of aquifers has to be done at the State level, taking into account the specific conditions, use situations, hydrogeology, chemical characteristics of the aquifers.

Senator DURENBERGER. I will ask you a question about Federal-State a little later on. The only thing that bothers me about that reply is the general rationale problem that I spoke to earlier and the pressures that are on the State and local level for making decisions about current use. Should I not worry too much about that?

Mr. CLARK. I think you should worry about that, and very definitely, because once the aquifer becomes contaminated, as you point out, attempting to remedy that situation can be at best a very expensive problem. I think it would be quite appropriate for the Federal Government to provide some inducements to the States to undertake this classification and management program. That is one of the issues that the ground water forum is trying to deal with.

Mr. ALM. Can I comment now because it follows from your last question. I would agree with Tony's implication that a pure nondegradation policy is impractical. But you raised a good question. Can States have varying kinds of standards?

I would say in terms of public health standards the answer is no, and I personally believe that it is important for EPA to move ahead and set public health standards under the Safe Drinking Water Act as quickly as possible.

I think when you are talking about differential protection, it deals with other uses, mainly agricultural and industrial uses. In some cases, we will be dealing with highly saline aquifers that have no potential use. In those cases, it seems ridiculous to spend a lot of money to clean them up.

On the other hand, there are some resources that are going to need more protection than current law allows. In those cases, we ought to take every step, at least at some level of government, for prohibiting activities that would contaminate the ground water in those areas.

Dr. STONE. I think nondegradation will also be an impractical approach overall. I think, however, it can be a goal in certain areas, depending on alternatives to the ground water as a source of

supply and on current and anticipated future uses, all those types of things.

The question that arises in my mind is, as you raised, who is going to determine which aquifers we keep and which we degrade? Furthermore, the more we try to specify that at the Federal level, the more likely we are to conflict with the varying priorities of different States in terms of what they see as the uses for their resource.

On the other hand, the less we try to specify that, the more likely we are going to get wide disparities among what the States are doing and the kind of protection that the public is receiving.

So it seems to me there is a key tradeoff here between what we would like at a national level and the fact that we have very site-specific problems and States have varying priorities with how they want to manage their resource given those problems.

Senator DURENBERGER. Let me yield to my colleague from Montana.

Senator BAUCUS. No, go ahead, Mr. Chairman.

Senator DURENBERGER. Without trying to get too far into the Federal-State thing, and I think this is all very, very interesting and it illustrates the difficulty we have in adapting the old strategies of Federal-State relations to this particular problem, are there specific sources of contamination for which you feel fairly strongly that the Federal regulatory role should be larger than it is today, for example?

Everything is out there and you all know them all. The theory is that we are regulating under Federal programs of one kind or another. Are there some today we are missing where just in the regulation of contaminants there ought to be a stronger Federal role?

Mr. ALM. Why don't I begin.

When we prepared the ground water strategy in EPA, two areas jumped out at us as needing greater control. One was leaking underground storage tanks, for which we took some programmatic steps and Congress passed legislation for dealing with them. The second area was pesticides. I think it is an area where the EPA ground water strategy has done the most good in the agency and one that bears careful scrutiny because of its great importance.

EPA will be reviewing municipal landfills as a potential source of contamination. That will be part of a task force effort. It may be that more Federal activity in that area is warranted.

Obviously, the big area that strikes us just looking at that map is fertilizer. I am not sure that that is particularly appropriately handled at the Federal level for a variety of reasons.

Dr. STONE. After we put together the information that we did on 33 different sources of contamination, of course the question was well, OK, so which of these sources should we really be concerned about?

As part of our analysis we developed different types of criteria for determining what is an important source. Is an important source one that is widespread? Is it one that has large volumes of materials in it that could potentially contaminate ground water? Is it one whose substances are toxic in nature? Is it one for whom the facilities are very numerous?

As we went through the analysis, we began to realize that depending on how you define what an important source is, you are going to end up with different lists of what are in fact the important sources.

It is very difficult comparing sources because, of course, they are measured in different units and we tend to look at only quantitative aspects to measure and compare sources. But I would say that of the lists that we developed, and just for illustrative purposes we developed about 10 different types of lists of important sources, depending on what we specified as important, we could see different sources coming out. There were sources that occurred on just about all of our lists. They included things like surface impoundments and landfills, hazardous as well as nonhazardous. It included things like injection wells and underground storage tanks. It included things like open dumps and septic tanks.

I think the key is to recognize that we need to have a consistent approach for thinking about what are important sources, and for those sources that do seem to be important, for controlling them. This certainly is a place where the Federal Government can start—in developing performance criteria or guidelines or whatever, in determining what kind of programs the States want or may already have, in assisting the States in dealing with their problem sources.

But a word of caution: just because some sources appear on our lists frequently doesn't mean they are all important to any one particular State. Even if a source doesn't appear on any of our lists it may still be the most important source to that State.

So I think in any case we would have to build in some type of flexibility to accommodate the differences and tremendous variations that the States have in viewing important sources.

Mr. CLARK. I would say that I think for many sources you are going to find it is going to be a combination of Federal, State and local control. Fertilizers, Al mentioned. There may be a role for the Federal Government in looking at how fertilizers are formulated. Some apparently will contaminate ground water more easily than others. But any implementation of any controls is going to have to be done at the State and local level.

The same is true with pesticides. There has to be a combination, I think.

Senator DURENBERGER. The last short question on the Federal-State issue gets at a combination of the Ogallala and its gradual disappearance and the *Sporhase* case. Now that the courts in this country have concluded that water is an article of commerce, I wonder if any of you see some role that Federal legislation might play in the quantity versus quality interface; the obvious example being might we give back to the State their sole right to appropriate ground waters out of the Ogallala, or wherever, in exchange for their promise to do it in a way that protects water quality.

Mr. CLARK. You have touched upon one of the more sensitive public policy issues, the control over quantity of withdrawals.

We are working on other projects with some of the Western States, including New Mexico, where there is some concern about how the *Sporhase* decision and the *El Paso* decision affect their water.

I think that probably there is eventually going to have to be some Federal involvement, but the people in the Western States are approaching this issue very tentatively, before trying to figure out what that should be.

Senator DURENBERGER. Anyone else?

Mr. ALM. I haven't thought about it enough to give any definitive comment.

Senator DURENBERGER. OK. I always wanted to stop somebody at that point.

Mr. ALM. From experience, it is an issue one wants to approach very gingerly.

Dr. STONE. I could only confirm the cautions.

Senator DURENBERGER. Max, do you have any comments you want to make?

Senator BAUCUS. Mr. Chairman, this issue is obviously so complicated, with so much potential for health problems in the country, that it seems to me that it makes a lot of sense to have vigorous congressional oversight to force the States to be more vigorous in what they are doing, and also to encourage EPA to be more vigorous in what it is doing.

I have noticed that there seems to be little coordination in EPA, say among RCRA efforts and Superfund and the Clean Water Act. It seems one section doesn't really know what the other is doing. There doesn't seem to be the coordination there should be.

I am wondering if any of you have any reaction to that, just the general thrust, at this point, because we don't know very much about the problem. I ask a lot of tough questions of a lot of people in the area, particularly of State officials and EPA and other State health officials and environmental officials, until we know more where we are, where we are going.

I would like each of you to respond to that, please.

Mr. ALM. If I may, Mr. Baucus, let me comment first about EPA's coordination. One of the problems an agency like EPA has is that it is dealing with a problem that is integrated and holistic, but the statutes and the work are broken into very discreet segments. It is very difficult to get back to look at these problems on a holistic basis.

That was particularly a problem in the ground water area because the nature of the ground water problem cuts across a number of EPA's programs. To cope with this challenge, EPA established an Office of Ground Water Protection and counterpart organizations in the regional offices to try to pull EPA groundwater activities together.

As I indicated in my testimony, it is tough because each one of these laws has their own legislative criteria on how they operate. It is very difficult to deal with ground water problems on a consistent basis using common criteria across programs.

Senator BAUCUS. Can't we put pressure on EPA to suggest how the statutes might be modified to enhance better coordination within the agency?

Mr. ALM. You have asked them to do that?

Senator BAUCUS. No, we have not. If we have, I don't know we have. It seems to me that might help a little bit.

Mr. ALM. I think that would be a very creative effort on their part to approach that.

On the question of States, I certainly agree with the implication of your question. Developing State Ground Water Programs is not going to be an easy task. I should say that some States are moving out ahead very fast. For example, I have talked to people in Florida. I would say that a State like Florida is way ahead of the Federal Government in dealing with ground water protection. And there are some other States.

Senator BAUCUS. Which other States come to mind? Florida is ahead. Who else?

Mr. CLARK. Wisconsin, Connecticut, and California have good programs.

Mr. ALM. The question is how do you bring the States up without disrupting what is happening now? One must remember that every time a new set of legislation or regulations comes down the pike, there is a tremendous amount of effort expended in conforming to those requirements, and to a certain extent that diverts efforts from other activities. If you are doing the right thing, that is fine, but there are times when I think regulatory changes have actually slowed up efforts to clean up the environment. I think that is something one has to be careful about.

I guess the last point I would make is I don't think we really know enough right now to establish a model State program. I think that it is useful to have a certain amount of experimentation within the States on how they approach ground water contamination.

Having said that, there has to be some common elements. I think the need for common standards is acute, particularly common health standards. Over time, there is going to be a need to develop a framework for classification, if classification is indeed the way the country goes. If Congress, on the other hand, decides to go on a nondegradation approach, classification might be irrelevant.

Senator BAUCUS. In what way is Florida ahead of the Federal Government?

Mr. ALM. Florida has done more in the regulatory area than Federal programs. First of all, they have had funding for programs prior to any funds being made available at the Federal level. Florida has a series of environmental sources of taxation that has given that State very adequate resources. They have done more monitoring. They have done more regulatory work. They have standards. They were ahead of the Government on underground storage tanks.

Senator BAUCUS. What prompted Florida to move more quickly?

Mr. ALM. It is a big public issue in Florida.

Senator BAUCUS. What caused the initiative?

Mr. CLARK. They are very dependent upon ground water for all of their drinking water supplies, and their ground water aquifer is very sensitive. They can get contaminations close to the surface. Anything that happens on the surface will quickly go into it. The wells are shallow so that the contaminants quickly get into the wells. They are aware of the problem.

Mr. ALM. They also have had very good leadership in the environmental agency in Florida.

Senator BAUCUS. Thank you.

Do either of you other two want to respond to my general question?

Mr. CLARK. On your general question about EPA coordination, I would like to emphasize something that Paula mentioned. Generally I think EPA is beginning increasingly to recognize the problem of coordinating their programs. I would say that they are getting better at this. I can give you one example.

I was at EPA in 1980, when the first proposed ground water policy came out, and the pesticides program was not included in it. At least now they are realizing that pesticides are a source of contamination.

We at the Conservation Foundation are looking at some of the issues that you have raised under what we refer to as a cross-media project, and we are considering whether there needs to be statutory changes to get improved coordination.

Senator BAUCUS. Are there any other countries that do a good job with all this?

Mr. CLARK. Ground water control?

Senator BAUCUS. Yes; Japan, Israel, Germany. Any countries that come to mind?

Mr. CLARK. Israel has a very good ground water management program, mostly focused on quantity management, not the sort of quality. Europe is just beginning to recognize how serious its ground water contamination problems are.

Senator BAUCUS. I take it you have looked at those countries sufficiently to know they are not doing very much. Do you know or do you not know?

Mr. CLARK. I do know what the European countries are doing.

Dr. STONE. With respect to EPA coordination, they certainly recognize that. I would also bring to your attention that coordination is also going to have to occur between EPA and the other agencies involved in the laws that are relevant to ground water protection, and we looked at 16 of those laws in our study. Only four of those laws come under the exclusive authority of EPA. And seven of the laws we looked at don't involve EPA at all. So I think we are going to have to start looking at other agencies as well and the role they play.

Senator BAUCUS. What are the most important other agencies?

Dr. STONE. Department of the Interior, Department of Defense, Department of Transportation, Department of Agriculture, DOE, if we are going to start looking at the breadth of sources that are involved.

I was going to make one other comment. You mentioned how much more we need to know, and I think the message that came to us over and over again in the course of our study is we do know a lot and we should be very careful not to become paralyzed by the apparently overwhelming nature of the problem.

Senator BAUCUS. I am not suggesting we stop. I am suggesting we forge ahead, but be legislative in our efforts here until we know more. It seems to me there is a place for the old concept of 50 States have 50 different laboratories. Let's see what works and doesn't work. There are problems there, too, I know, but there seems to be something to that.

No further questions.

Senator DURENBERGER. Thank you very much, ladies and gentlemen. We appreciate your testimony. We will be seeing more of you.

The hearing is adjourned.

[Whereupon, at 11:45 a.m., the subcommittee was recessed, to reconvene subject to the call of the chair.]

[Statements submitted for the record follow:]

Statement of Philip Cohen, Chief Hydrologist, U.S. Geological Survey, before the Subcommittee on Toxic Substances and Environmental Oversight of the Committee on Environment and Public Works, United States Senate, June 17, 1985

OVERVIEW OF GROUND-WATER AVAILABILITY IN THE UNITED STATES

My name is Philip Cohen. I am Chief Hydrologist of the U.S. Geological Survey (USGS). My statement is intended to provide an overview on ground-water occurrence and use and on ground-water quality in the United States. In my brief remarks I will summarize several important aspects of ground-water availability in the United States, and emphasize the interdependence of ground-water flow and ground-water quality.

As the Nation's largest scientific and data-collection agency concerned with water resources, the USGS has conducted technical investigations concerned with ground-water supply and quality for over 100 years. The USGS's hydrologic staff of over 1,600 hydrologists, geologists, chemists, engineers, and biologists is the largest in the United States, and is currently conducting field or laboratory investigations on almost 600 ground-water studies located in each of the 50 States, Puerto Rico, and island territories. USGS programs supporting these activities include the Federal-State Cooperative Program wherein costs of the investigations are shared equally by the Federal Government and by State and local water agencies; the Regional Aquifer-System Analysis Program that is designed to provide hydrologic and geochemical information on 28 of the Nation's most important aquifers; the Toxic-Waste/Ground-Water Contamination Program which is producing information on the geologic controls, and the physical, chemical, and biologic processes that control the movement, alteration, and fate of toxic substances in ground water; the Nuclear Hydrology Program which is concerned with the development of geohydrologic criteria to guide the selection of suitable disposal environments for low-level and high-level

nuclear wastes; and the National Research Program which is engaged in basic studies of the physical, chemical, and biologic processes that are essential to an understanding of the ground-water resources. The bulk of the information available to describe the Nation's aquifers and ground-water conditions has been developed by these programs, by State water agencies and municipalities, and by the private sector. This year USGS ground-water programs are funded at a level exceeding $90 million.

Drawing upon that body of information, the following generalizations regarding the state of the Nation's ground-water resource can be made:

Ground-Water Use.--Although unevenly distributed, the Nation's ground-water supplies are abundant. The volume of ground water presently in storage in the Nation's aquifer systems has been estimated to be on the order of 50 quadrillion gallons, or about 16 times the volume of the Great Lakes. However, at least half of this volume represents deep-lying saline water, with little or no potential for development. The flow through the ground-water system in the United States has been estimated at between 600 and 1,000 billion gallons per day (bgd). This includes a large amount of very shallow circulation, which presently discharges to surface streams without reaching major aquifers, but some of which could presumably be diverted into deeper patterns of flow in response to pumping.

The pumpage of ground water in the United States in 1980 was estimated at approximately 88 bgd, which is on the order of 10 percent of the estimated natural flow through the Nation's ground-water systems. Viewed in a national sense, therefore, the resource is not overdeveloped; locally, however, the situation can vary widely, and a number of problems exist. Ground-water pumpage has increased steadily over the last three decades, increasing from 35 bgd in 1935 to 88 bgd in 1980. The total ground-water pumpage in 1980

represented about 20 percent of the total use of water in the United States, excluding hydroelectric power generation. The largest single use of ground water is for irrigation, which in 1980 accounted for slightly more than 60 bgd. It is important to note, however, that while the use of ground water for irrigation represents the largest withdrawal, roughly half of the population of the country relies on ground water for domestic supply. Some of the factors responsible for the continued increase in ground-water use include: significant expansion of irrigation, particularly in areas where it has not been extensively practiced in the past; water-supply requirements of growing urban areas, particularly in the south and southwest; water demands associated with energy production; a desire to establish drought-resistant supplies; and limitations on the construction of new surface reservoirs.

About two-thirds of the 1980 pumpage, or approximately 56 bgd, was concentrated in eight States, as follows: California (14.6 bgd); Texas (9.7 bgd); Nebraska (7.1 bgd); Idaho (6.3 bgd); Kansas (5.6 bgd); Arizona (4.2 bgd); Arkansas (4.3 bgd); and Florida (3.8 bgd). For the most part, these figures reflect the heavy use of ground water for irrigation in those States.

With proper management, substantial further increases in ground-water development are possible in many parts of the country without generating major hydrologic problems. Problems exist, however, in areas such as Arizona and the Southern High Plains where intense irrigation demand for ground water far exceeds the rate of natural replenishment, and in parts of the eastern section of the country, such as the Chicago-Milwaukee area where municipal and industrial pumping has resulted in water-level declines in excess of 800 feet.

In water deficient areas, such as southern Arizona and the Southern High Plains, long-term withdrawal of ground water from storage (ground-water mining) has supplied agricultural and municipal needs for many decades. These withdrawals cannot be sustained indefinitely. Decreases in pumpage are already taking place as falling water levels cause well yields to decrease and pumping costs to rise. On the other hand, in humid areas such as Florida and the Atlantic Coastal Plain, ground-water development has redistributed the natural flow pattern, so that water which originally discharged to streams, to the sea, or by evapotranspiration is now diverted to well fields. In these areas, the ground-water system conveys water from source areas to points of use, and provides short-term storage during drought; however, the net depletion of ground water in storage has been small from predevelopment to the present.

Adequacy of Information in Ground Water.--Much information, data, and analyses are available to describe the extent, character, and flow patterns of the Nation's principal aquifers. In terms of water use, those aquifer systems supplying about 80 percent of the ground water pumped in the United States have been described at regional scales, and to varying degrees at local or intermediate scales. In addition, data are available for many smaller or less utilized aquifers where local studies may have been conducted for development of municipal or industrial water supplies. In an increasing number of instances, computer simulation studies provide quantitative descriptions of aquifer flow dynamics, including recharge-discharge mechanisms and the effects of development. An abundance of raw data exists in computer files maintained by the USGS, the U.S. Environmental Protection Agency (EPA), and various State agencies. The USGS ground-water file alone contains more than 900,000 entries of well-site information such as aquifers penetrated and water levels.

Despite this seeming abundance of data, in many cases existing information is insufficient to address new problems or to analyze new aspects of aquifer development or protection. Most often the problem is one of scale, where local studies, perhaps designed within the framework of a regional analysis, must define the geology and hydraulic properties of an aquifer at a detail considerably greater than for the regional analysis. This factor is critically important in the case of point sources of contamination where the impacts are most often limited to the immediate vicinity of the source. In most instances, contaminant plumes will extend laterally only hundreds or thousands of feet from the source. In unusual circumstances where a source has been continuous over many decades, identifiable plumes are known to extend laterally 11,000 feet or more. Even at that scale, the dimensions of the plumes are miniscule in relation to the aquifers as a whole. Accordingly, while a general knowledge of the aquifer systems will provide a general understanding of contaminant movement, each site of contamination must be evaluated individually.

Quality of Ground Water.--Much is known about the naturally occurring major dissolved constituents in ground water in the Nation's aquifers, but little is known of the extent or the magnitude of naturally occurring trace elements and most manmade or man-induced contamination. Analyses of natural ground-water chemistry have been made for many decades, and in aggregate, they allow useful characterization of the spacial variability of water quality within the Nation's aquifers, and evaluation of the suitability of the water for various uses, such as irrigation or industrial processes. The bulk of information on ground-water quality is contained in massive computer files maintained by the USGS and EPA.

Changes in ground-water quality can occur through a variety of mechanisms such as the intrusion of saline water into aquifers as the result of pumping, increased salinity and concentration of dissolved substances in irrigation return flows, or leaching and mobilization of toxic trace elements from unsaturated deposits above an aquifer.

The introduction of toxic substances in ground water presents formidable problems in both sampling methodologies and strategies, and in analytic procedures. The nature and extent of each contamination must be based on detailed local study. Further, the costs of analyzing ground-water samples for the thousands of possible toxic substances is far more expensive than analyzing for natural chemical constituents. As a result of these two factors, and because of the relatively short timespan over which ground-water samples have been analyzed for trace constituents, little information on the national distribution of toxic substances in ground water is available. Only at specific sites where detailed studies have been made has such information been obtained.

Toxic contaminants include dozens of inorganic and radioactive elements and compounds, tens of thousands of organic compounds, and numerous bacterial and viral micro-organisms. Among the most commonly occurring toxic contaminants are nitrate, heavy metals, polynuclear aromatic hydrocarbons (from petroleum fuels and coal tar derivatives), trichloroethylene and related solvents, pthalates, toluene, and benzene. Ground water is more prone to retain volatile compounds such as trichloroethylene than surface water.

The behavior and fate of contaminants in ground water is governed by a complex matrix of interdependent physical, chemical, and biological processes. Physical processes include ground-water flow and dispersion of the contaminant, evaporation, filtration, and buoyant and phase separations. Chemical reactions include solution precipitation, hydrolysis, oxidation/reduction, complexation, and ion exchange/sorption. Microbiological processes involve decomposition, cell-synthesis, and transpiration.

Although we know something about all these processes, our knowledge is inadequate to make substantive quantitative assessments or predictions of contaminant behavior and fate in most ground-water systems. Better sample collection and handling techniques and better methods for determining key parameters in the field need to be developed for nearly all the above processes. Considerable effort is needed to understand the relative importance of these processes to the point that simplified models can be built. Also demanding attention is the need for better data-collection technology and enhancement of indirect sensing techniques such as surface geophysical methods. Moreover, much remains to be done to characterize the quality of most of the Nation's ground water, and to monitor changes therein.

Finally, we would like to call to the attention of the Committee a new publication very recently published by the USGS--"National Water Summary 1984; Hydrologic Events, Selected Water-Quality Trends, and Ground-Water Resources." Included in the report are several articles relevant to this Committee's deliberations. Perhaps most noteworthy are articles related to ground-water contamination and a State-by-State summary of the ground-water hydrology and ground-water withdrawals of the Nation.

TESTIMONY OF
PAULA J. STONE
OFFICE OF TECHNOLOGY ASSESSMENT
UNITED STATES CONGRESS

BEFORE THE
SUBCOMMITTEE ON TOXIC SUBSTANCES AND ENVIRONMENTAL OVERSIGHT
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

JUNE 17, 1985

Mr. Chairman and members of the Subcommittee, my statement responds to your request for an overview of the Nation's groundwater contamination problems as analyzed in the Office of Technology's report, Protecting the Nation's Groundwater From Contamination. The OTA report was requested by the full Committee on Environment and Public Works to assess the current status of the Nation's knowledge about and experience in dealing with groundwater contamination problems and, in turn, to develop an analytical framework in which to address contamination issues from a national policy perspective. The 2-volume OTA report was released by the Committee in October 1984.

The assessment was requested in response to growing national concern about groundwater contamination. Contamination is being detected with increasing frequency. OTA documents that it has now been found in every State. And contamination is linked to adverse health, economic, environmental, and social impacts. The detection of contaminated groundwater and associated adverse impacts are also likely to increase. For example, contaminated groundwater is often located near heavily populated areas, which increases the risks of exposure. And groundwater is being increasingly relied on for many types of uses and now supplies the Nation with one-half of its drinking water.

In general, the OTA report analyzes, and provides supporting documentation about:

1. sources of contamination, the contaminating substances themselves, and both health and nonhealth impacts,
2. technologies for conducting hydrogeologic investigations (e.g., monitoring) and corrective actions (i.e., containment, withdrawal, treatment, insitu rehabilitation, and management options),
3. 16 Federal laws and their provisions for protecting groundwater quality, and
4. responses from the 50 States to an OTA survey about State groundwater-related activities.

THEMES OF THE OTA REPORT

Three key themes emerge from the OTA analysis.

Theme #1. While there are many aspects of groundwater contamination problems that are not well-documented or well-understood scientifically, much is now known about these problems, specifically about sources of contamination, the contaminating substances themselves, and impacts.

The OTA report documents 33 different sources known to have contaminated groundwater. These sources represent activities that occur throughout society, and they are extremely diverse in nature. For example, some sources are specifically designed to discharge substances into the subsurface (e.g., septic tanks and injection wells). Others discharge substances into the subsurface even though they are designed to retain, treat, or store potential contaminants (e.g., underground and aboveground storage tanks). Some sources release

contaminants during transport or transmission (e.g., pipelines). And sources can contaminate groundwater either as the consequence of other planned activities (e.g., pesticide and fertilizer applications); by providing a conduit for or altering groundwater flow patterns (e.g., production wells); or, although naturally occurring, because of human activities (e.g., salt-water intrusion). (See Table 1.)

The OTA report documents over 200 substances that have been detected in groundwater. The listing includes over 150 organic chemicals, about 40 inorganic chemicals, about 20 radionuclides, and various microorganisms. Importantly, any one contaminant may be found in one or more types of sources. For example, pesticides could enter groundwater via land applications, leakage from storage tanks, seepage from landfills and residential disposal sites, and spillage during transport.

Many of the substances being found in groundwater are individually known or suspected of having significant health risks. However, definitive evidence for human health effects is limited and will likely remain so for the foreseeable future. For example, most available information is based on animal studies; there are no health effects data for many contaminants; and there are essentially no health effects data about the effects (e.g., synergistic) caused by mixtures of contaminants. Nevertheless, the OTA analysis links 24 adverse health effects to contaminants found in groundwater. The most serious of these effects are damage to the liver, kidney, and central nervous system, and cancers.

Nonhealth impacts are likely to be large, but documentation is scarce. What information exists tends to be lacking in the detail and consistency

necessary for analysis. In addition, methodologies are virtually nonexistent for systematically assessing these impacts (e.g., how to discount future net benefits). Economic impacts included in this category are the costs of lost productivity and of procuring alternative water supplies. Environmental impacts include damage to vegetation and aquatic life. Social impacts often relate to pyschological stress and social disruption.

Importantly, current knowledge about groundwater contamination -- about numbers and types of sources, contaminants, and impacts -- is conservative. For example, the detection of a contaminant does not reflect actual site conditions as much as it does the nature of the investigation -- which, why, when, where, and how contaminants are being looked for. Because potential contaminants are used throughout society, more widespread detection can be expected as efforts increase to monitor known problems, locate as yet undetected problems, and monitor potential problems.

Theme 2. The OTA study characterizes the concept of "protecting" groundwater quality as involving a balancing among activities to detect, correct, and prevent contamination. Depending on site conditions -- including the potential for human exposure to the contaminating substances, the vulnerability of the aquifer to the entrance and movement of contaminants, the availability of alternative water supplies, and current and/or potential uses -- one or more of these activities may be required.

There is, however, no technology "fix." Techniques for conducting hydrogeologic investigations are able to provide reliable site information for almost all environments, but they are expensive; and analytical methods (e.g.,

for analyzing water quality samples) can bias which contaminants and concentrations are measured. Options for corrective action are not only costly but their effectiveness is not proven. And the successful application of all techniques depends on the ability of trained personnel to tailor them to site conditions. The importance of the site-specific nature of contamination problems is emphasized throughout the OTA report.

The costs and technical uncertainties associated with detection and correction activities effectively preclude the investigation and remediation of all known and suspected problems. Therefore, prevention will be a critical aspect of protection programs if future problems are to be averted; and many types of prevention options appear to be available (e.g., process and product changes for waste reduction). But even then, not all potential contamination is likely to be preventable. The prevention of groundwater contamination will depend on such factors as the availability of alternatives to the contaminating activity, site conditions, the development of a prevention "ethic," and enforceability of regulations.

Theme 3. While Federal and State efforts have made important contributions to protecting groundwater quality, they are still limited in their ability to protect groundwater from contamination. For example:

There is no explicit national legislative mandate to protect groundwater quality.

Groundwater quality-related programs among, and within, institutions are often not coordinated, nor are they coordinated with programs for groundwater quantity or for surface water even though groundwater and surface water, quality and quantity, are interconnected.

Most authorized programs are in their early stages of development and implementation, and some of them are years from being fully in place. Other authorities have been only partially implemented. Many years will be required to ascertain adequately the effectiveness of these programs.

While there are precedents at the national level to detect, correct, and prevent contamination (see Table 2), coverage is limited and inconsistent. To illustrate, prevention under the Sole Source Aquifer Provision of the SDWA, which protects recharge areas, is not comprehensive because the designation of protected areas is optional and only certain potentially contaminating projects are restricted (i.e., certain projects are restricted from receiving Federal assistance). The application of provisions that regulate the production and use of substances -- under TSCA and FIFRA -- to prevent contamination has also been limited.

While existing Federal laws cover most known sources of contamination in some way (see Table 3), coverage is not as complete as it first appears. In general, attention at the Federal and, in turn, the State levels has been focused on selected point sources associated with hazardous wastes. Sources that are usually not addressed, and which are also known to contaminate groundwater, include non-point sources (e.g., pesticides and fertilizer applications) and sources associated with non-hazardous wastes (e.g. residential disposal) and non-waste products (e.g., aboveground and underground storage tanks).

There are only 22 mandatory Federal water quality standards established by the National Interim Drinking Water Regulations (NIDWRs) under the SDWA. Of these 22 standards, only seven are for organic chemicals; and many of these 7

are for pesticides whose use has already been banned. Further, most established standards are based on Public Health Service standards of the 1960's.

Federal and State laws and programs address public water supply systems. There are an estimated 12-14 million private wells in the Nation, serving perhaps as much as 25 percent of the population with drinking water. There is no required routine monitoring of these wells.

GENERAL POLICY IMPLICATIONS

The three major themes of the OTA report raise many policy questions. But, critically, to answer any one of these questions will require the commitment of a tremendous amount of what are already scarce resources -- trained people, money, and time. And even if the commitment is made, we may still not be able to obtain the answer we had hoped for, with the clarity and expediency we desire, because there will always be some uncertainty associated with a problem that cannot be observed directly.

Because of the enormity and complexity of the groundwater protection task, the national policy challenges that are pursued need to be selected carefully to ensure that we receive the maximum returns for the resources committed. Based on this perspective, key national policy questions would be those whose answers could fundamentally change the way the Nation now perceives and addresses groundwater contamination problems. Thus, the decision to undertake a policy challenge would involve asking:

> Is the information we would obtain from further study or analysis of this policy question likely to convince us any better that we have to act, direct us to do anything differently, or enable us to address the problem any better at the site level, than based

on what we already know?

The overall message of the OTA report is not pessimistic, but it is urgent. The OTA study concludes that continuing and worsening degradation of the groundwater resource can probably be averted. But achieving this outcome will require accepting three policy challenges:

1. focusing national attention on the groundwater resource itself and on the interactions between groundwater and other environmental media;

2. implementing and expanding programs to cover the sources, contaminants and users not now addressed; and

3. providing adequate, sustained, and flexible Federal support to the States.

FOCUS ON THE GROUNDWATER RESOURCE.

No law has as its principal objective the protection of groundwater quality. Historically, laws have been intended to protect environmental media other than groundwater (e.g., surface water and air) primarily from contamination by specific sources. While this evolution has resulted in a set of laws and programs that are relevant to groundwater quality, it nevertheless has not provided for systematic and coherent protection of the groundwater resource. For example, there is no consistent definition of the groundwater

resource to be protected by existing Federal programs.[1] The task of developing a coherent approach to protection also becomes increasingly difficult as both the array of existing programs becomes fully implemented and the number and complexity of programs increase.

A focus on the groundwater resource, as well as on the interactions between groundwater and other environmental media, would involve addressing the breadth and diversity of sources affecting groundwater. In addition, legislative vision would need to be broadened from the traditional source-by-source approach to recognize the flow of contaminants through society, the relationships among recharge areas, land use, and groundwater quality, and the interactions between both groundwater and surface water, and water quality and quantity.

IMPLEMENT AND EXPAND PROGRAMS.

The OTA study is chiefly concerned with issues related to the expansion of programs. The difficulties associated with expanding programs for sources can be inferred from Table 3, referred to above. Coverage with respect to contaminants provides another example. Because States perceive a virtual absence of Federal standards, they are setting their own standards. The

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1 Of the programs examined in the OTA study, four of them address groundwater in general (authorized by AEA for low-level waste sites, FLPMA, SMCRA, and TSCA). Two programs are concerned with the uppermost aquifer (authorized by RCRA Subtitle C and UMTRCA). Three programs cover underground drinking water supplies (authorized by RCRA Subtitle D, SDWA, and CWA Section 405). One program separates groundwater into several categories (Section 201 of CWA). Five programs do not directly address groundwater in any way (authorized by Sections 311 and 404 of CWA, CZMA, FIFRA, HLPSA, and HMTA). And one program includes consideration of surrounding hydrogeologic systems (authorized by AEA for high-level wastes).

consequences of State initiatives in standard-setting are twofold:

1. different States are setting standards for different substances, and
2. different States are setting different standards for the same substance.

A national policy challenge that emerges is how to reconcile at the national level the fact that different States are achieving different levels of progress with their protection activities and that, in turn, the citizens of different States may be receiving different levels of protection from the same contaminants.

FEDERAL SUPPORT TO THE STATES.

While groundwater contamination is a problem with nationwide dimensions, the problem must ultimately be solved on a site-specific basis. The site-specific nature of problems, together with variations among the States in terms of their priorities, problems, capabilities, stages of program development, and institutions, fundamentally shape the form of national policy options. For these reasons, it is the States, in the end, who will need to choose among, design, and implement detection, correction, and prevention activities. In addition, land use considerations, essential for preventing contamination from non-point sources and from clusters of point sources, and water rights, which may be important for implementing such protection activities as corrective actions, have also traditionally been addressed at the State and local levels. The OTA report thus concludes that the search for national policy options is driven by ways in which the Federal government can be most supportive of the States in their protection efforts.

The provision of systematic Federal support to the States is possible because, while groundwater contamination problems are site specific, there are nevertheless elements that problems share in common. The Federal government is in a unique position to mobilize and provide efficiently the information, guidance, and resources that are required by all States to address these elements. These commonalities, in turn, would enable the Nation to develop a comprehensive and consistent (as opposed to uniform) approach to contamination. Further, this approach could be implemented via State protection programs. For example, a consistent and complete range of potential factors could be specified for consideration in designing State programs (e.g., for detection, correction, and prevention, and for the full range of sources, contaminants, and users); but the choice of which factors are ultimately included in a State program would be determined in accordance with site conditions.

The OTA analysis identifies three major areas for Federal support:

1. technical assistance,
2. funding, and
3. research and development.

The Federal government may also be in the best position to address interstate contamination problems, any discepancies among State programs that lead to national dislocations, regional issues, and situations where the States do not have adequate authority. Developing an effective Federal/State partnership, based on mutual trust and respect, is another important policy challenge facing the Nation.

Current Federal laws and programs have generally helped States to deal with groundwater contamination. However, the level of support is not perceived to be

adequate by most States, nor is it directed at all of the problems States have identified. In some cases, States feel that Federal initiatives have actually hindered State efforts because Federal efforts lack an explicit goal (which has resulted in uncoordinated and confusing Federal programs and has handicapped States in obtaining authority to address certain problems), fail to recognize the interrelationships among all environmental media, and fail to accomodate variations in State conditions.

Technical Assistance.

Three general types of technical assistance are identified by the OTA study:

i. training and education,

ii. the development of criteria and/or guidelines, and

iii. information exchange.

The successful application of any activity to detect, correct, or prevent contamination will depend on the ability of trained and experienced personnel to tailor the activity to site conditions. The supply of qualified technical personnel appears to be limited and to be a constraint on the Nation's ability to protect groundwater quality. Federal support for training and educational programs is required for a rapid increase in the Nation's technical capabilities. Training could serve several purposes including to improve the administration of programs (e.g., in-house training for those implementing and enforcing programs), to improve the management practices and procedures of special interest groups (e.g., professional certification programs), and to inform or educate the public (e.g., publications and workshops).

Technical assistance is being provided through several existing programs. For example, the States have been assisted by the Cooperative Program of the U.S. Geological Survey, and they would like to see it and other technical assistance programs (e.g., of the SCS) continued. The ability of other government agencies (e.g., the National Bureau of Standards) and laboratories (e.g., the EPA laboratories at Ada, Cincinnati, Las Vegas, and Athens) to provide technical assistance also needs to be exploited.

The commonalities among problems are amenable to the development of Federal criteria and/or guidelines. (See Table 4.) From a national perspective, one goal of these criteria and/or guidelines would be to improve site-specific judgments by ensuring that at least a minimum set of considerations is taken into account for protecting groundwater quality. For example, consistent protocals could be established for determining when, where, and how to monitor specific sources. However, whether or not a source will, in fact, be monitored, and the details of the monitoring program, must be tailored to site-specific conditions. Criteria and/or guidelines would also be an efficient means of providing technical and other information required by all States in handling their problems.

Because there are many aspects of groundwater problems that are not well-understood or well-documented, the temptation is great to collect more information. However, the task of gathering data and making them comparable, coherent, and accessible will be enormous. For example, much data already exist, but they are being collected by many different agencies, for different purposes, and for specific sites. Responses to the OTA State Survey confirm that States do not desire detailed site information from a centralized (i.e.,

Federal) data source. Rather, the States desire an exchange of information about programs -- what types of programs other States have, how well different programs are working, what elements have been identified as important for program success, and why some programs have failed.

Any effort to establish a national data base therefore needs to identify the types of information that would not only facilitate and improve the Federal regulatory process but also support State decisionmaking. At a minimum, information transfer would be assisted by establishing standardized methods for future data collection so that if an agency were to collect that data, the data would be usable to other interested parties. The OTA study found no support for a national groundwater monitoring network.

Federal data collection mechanisms are already in place to carry out regulatory programs. An overall strategy for obtaining and exchanging information is nevertheless required. EPA is in the process of developing a groundwater monitoring strategy. OTA urges EPA to focus on the objectives of any data collection effort, to articulate how the data would be actually used to improve decisionmaking if they were collected, and to link the monitoring strategy directly with the EPA groundwater protection strategy.

Private organizations also collect and retain groundwater-related information because of pending litigation, patent issues, and client relationships. Control over this information apparently preserves the power and marketability of those "in the know." As a consequence, while some types of privately-held information do tend to be disseminated to the public (e.g., technology specifications), other types do not -- such as how well these technologies perform in given instances.

Funding.

The availability of funding will fundamentally shape groundwater protection efforts. Currently, no Federal program has earmarked funds specifically for the protection of groundwater quality. In addition, funding for programs that have supported groundwater-related activities has been reduced or eliminated (e.g., funding under Section 208 of the CWA, for State solid waste programs under Subtitle D of RCRA, and for the Rural Abandoned Mine Program under the SMCRA). As a result, groundwater and other water quality programs are competing for limited State grants (e.g., under Sections 106 and 205(j) of the CWA; note that the FY 85 budget supplement provides $7 million to the States under Section 106 for the development of State groundwater programs). Federal funding is desired by the States for both the development and implementation of State initiatives. In the absense of adequate monies, States are able only to react to rather than anticipate problems. Innovative methods for cost recovery would be available at different levels of government (e.g., general taxes, permits and license fees, user charges, and special assessments).

Research and Development.

Key research and development activities could provide timely information to support all States in their groundwater protection efforts and could fundamentally alter the ways in which the Nation now perceives and/or addresses contamination problems. (See Table 5.) In some cases, the development of

innovative methods may require incentives, or the removal of disincentives that delay the entry of such innovations into the marketplace.

PRINCIPAL LEGISLATIVE OPTIONS

There are three general legislative approaches for incorporating the key policy elements identified above (i.e., focusing on the groundwater resource, implementing and expanding programs, and providing support to the States) into a national policy for groundwater protection:

1. base further policy development on the existing legislative framework,
2. develop specific groundwater protection legislation, and
3. rely on administrative initiative.

Because any legislative approach would incorporate the three key policy elements, the choice of approach represents more a choice of emphasis, based on the practical difficulties in implementing that option, than necessarily a major difference in content. Some combination of all approaches may ultimately be the preferred choice, with the advantages of each approach being incorporated.

Option #1. Base further policy development on the existing legislative framework.

This approach generally regards the current statutory framework as sufficient for groundwater quality protection. The principal advantages of this option are that it embodies incremental adjustments along established policy precedents, and it focuses on the implementation and enforcement of existing provisions. The historical source-by-source emphasis is preserved, consistent

with that of existing laws and resulting administrative arrangements.

The disadvantages of this approach include: the approach need not directly and systematically address gaps and inconsistencies in the existing framework; each law has its own timetable for reauthorization, and delays in reauthorization of a specific law could delay overall groundwater protection efforts; and an emphasis on only selected laws may not prove to be the most cost-effective over the long term for protecting groundwater quality once the breadth and diversity of problems are acknowledged.

Option #2. Develop specific groundwater protection legislation.

One of the principal advantages of groundwater-specific legislation is its ability to facilitate directly a comprehensive, consistent approach to contamination problems. It could, for example, provide a unifying statement of purpose or intent with respect to the resource: the goal could establish as national policy the protection of health and the environment from groundwater contamination, the protection of the quality of all groundwater, the differential protection of groundwater quality based on resource value, or the protection of groundwater quality to specified levels. [2] Importantly, as the specificity of the national goal increases, the risks increase that the national goal will conflict with the priorities and objectives of different States. Alternatively, the more general the national goal, the more likely that the quality of groundwater being achieved in different States will diverge.

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2 Not all Federal laws examined by OTA have an explicit policy statement, but these laws (e.g., CERCLA, FIFRA, and HLPSA) do authorize or require certain Federal actions.

Groundwater-specific legislation would also: (i) formally recognize the national dimensions of the problem; (ii) formally recognize the already demonstrated Federal interest in the problem and provide an explicit vehicle for systematically evaluating, developing, and implementing Federal activities; (iii) provide States with authority to deal with the full range of their problems even if these problems are not explicitly addressed at the Federal level; and (iv) formally broaden legislative vision away from the traditional source-by-source approach to contamination.

There are also several important disadvantages with groundwater-specific national legislation. For example, reaching consensus on a single code may prove difficult given variations among the States and the breadth of problems involved. In addition, new legislation may be difficult to couple with the existing legal structure. Comprehensive environmental legislation has also historically been suspect of trying to alter traditional roles among Federal, State, and local governments for managing land use and water rights.

Option #3. Reliance on administrative initiative.

This option implies minimal changes to the existing legislative framework to achieve groundwater quality protection and focuses on regulatory mechanisms as the principal vehicle for change. One of the key advantages of this approach is the removal of pressure from the reauthorization process. But pursuing this option could also delay the implementation of needed program changes -- changes Congress is already considering. Importantly, agencies are mission-oriented, and agency objectives and constraints are likely to drive administrative programs, not necessarily with the comprehensive vision that is required.

Reliance on voluntary initiative will be chosen de facto to the extent that Congress defers action on the Ground-Water Protection Strategy of the U.S. Environmental Protection Agency (EPA, August 1984) for groundwater protection rather than legislation. Subsequent hearings of this Subcommittee will focus explicitly on the EPA Strategy; and OTA would make only the following observations here:

EPA is not the only Federal agency with responsibilities for groundwater; and the active participation of all relevant agencies will be necessary for comprehensive groundwater protection. [3]

With respect to a focus on the groundwater resource: the EPA Strategy acknowledges that groundwater is a "resource that demands a comprehensive approach (p. 29)," but the details of the Strategy do not provide for it. For example, the Strategy continues to embody a source-by-source approach to protection; and issues related to the interactions between groundwater quality and quantity, and groundwater and surface water are not addressed.

In terms of implementing and expanding programs: the premise of the Strategy is that there is sufficent statutory and regulatory flexibility to protect groundwater. Implementation of programs under the Strategy depends on classification; but the Strategy does not address the practical disadvantages of classification, the biases inherent in the Strategy's definitions of classes, or

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3 Of the 16 laws examined in the OTA report, only four are the exclusive responsibility of EPA (FIFRA, RCRA, SDWA, and TSCA). Five laws are the joint responsibility of EPA and at least one other agency (AEA, CWA, CERCLA, NEPA, and UMTRCA). And seven laws do not involve EPA at all (CZMA, FLPMA, HLPSA, HMTA, RA, SMCRA, and WRDA). Overall, at least seven Federal agencies, spanning almost 20 offices, are involved (DOE, NRC, EPA, and the Departments of Agriculture, Transportation, Commerce, and Interior).

the consequences for the States arising from EPA's adoption of the scheme. Expansion of programs under the Strategy focuses on certain unaddressed sources; but no consistent criteria appear to have been used to select these sources, and the approach to be taken is additional study and review. The Strategy is ambiguous about its intentions for expanding the NIDWR's. And the Strategy does not address private wells because they are considered to be the States' responsibility.

The Strategy confers primary responsibility to the States for groundwater protection, but the Strategy also depends on the States' voluntary participation. Further, although many States have made progress in dealing with their contamination problems (and, in some cases, more than the Federal government), many have not. In terms of providing technical assistance to the States: training and education are not addressed in any detail in the Strategy; criteria and/or guidelines are discussed principally in the context of classification; and the Strategy is ambiguous regarding information exchange although reference is made to the forthcoming EPA groundwater monitoring strategy. With respect to funding: EPA will "encourage States to make use of existing grant programs to develop ground-water protection programs and strategies...EPA will not support routine operational or implementation activities as a part of ground-water program development activities (p. 35)." And the Strategy is ambiguous about its plans for research and development activities. In summary, in the absence of sustained and adequate support for carrying out State programs, as well as a strong Federal mandate, the establishment of meaningful State programs appears unlikely based on information available to OTA.

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CONCLUSIONS

The protection of groundwater quality will represent a major long-term national commitment. Decisions made today will also determine the range of options available to future generations regarding the groundwater resource.

Looking towards the future, suppose that the commitment is now made to protect the resource and that programs are developed, time is devoted, and people are trained. How will we gauge our success? How will we know when the Nation does not have a groundwater contamination problem anymore?

The answer is likely to be complex because contamination problems cannot be observed directly, because we're only finding what we're looking for, and because quantitative estimates of groundwater quality nationwide would be prohibitively expensive and time-consuming to develop. At a minimum, the answer will certainly depend on developing realistic expectations about what is achievable. And it will depend on assuming responsibility for and control over our environmental destiny in order to build public trust and confidence.

Table 1. Sources of Groundwater Contamination

Category I—Sources designed to discharge substances
Subsurface percolation (e.g., septic tanks and cesspools)
Injection wells
- Hazardous waste
- Non-hazardous waste (e.g., brine disposal and drainage)
- Non-waste (e.g., enhanced recovery, artificial recharge, solution mining, and in-situ mining)

Land application
- Wastewater (e.g., spray irrigation)
- Wastewater byproducts (e.g., sludge)
- Hazardous waste
- Non-hazardous waste

Category II—Sources designed to store, treat, and/or dispose of substances; discharge through unplanned release
Landfills
- Industrial hazardous waste
- Industrial non-hazardous waste
- Municipal sanitary

Open dumps, including illegal dumping (waste)
Residential (or local) disposal (waste)
Surface impoundments
- Hazardous waste
- Non-hazardous waste

Waste tailings
Waste piles
- Hazardous waste
- Non-hazardous waste

Materials stockpiles (non-waste)
Graveyards
Animal burial
Aboveground storage tanks
- Hazardous waste
- Non-hazardous waste
- Non-waste

Underground storage tanks
- Hazardous waste
- Non-hazardous waste
- Non-waste

Containers
- Hazardous waste
- Non-hazardous waste
- Non-waste

Open burning and detonation sites
Radioactive disposal sites

Category III—Sources designed to retain substances during transport or transmission
Pipelines
- Hazardous waste
- Non-hazardous waste
- Non-waste

Materials transport and transfer operations
- Hazardous waste
- Non-hazardous waste
- Non-waste

Category IV—Sources discharging substances as consequence of other planned activities
Irrigation practices (e.g., return flow)
Pesticide applications
Fertilizer applications
Animal feeding operations
De-icing salts applications
Urban runoff
Percolation of atmospheric pollutants
Mining and mine drainage
- Surface mine-related
- Underground mine-related

Category V—Sources providing conduit or inducing discharge through altered flow patterns
Production wells
- Oil (and gas) wells
- Geothermal and heat recovery wells
- Water supply wells

Other wells (non-waste)
- Monitoring wells
- Exploration wells

Construction excavation

Category VI—Naturally occurring sources whose discharge is created and/or exacerbated by human activity
Groundwater—surface water interactions
Natural leaching
Salt-water intrusion/brackish water upconing (or intrusion of other poor-quality natural water)

Table 2. Summary of Federal Programs and Activities Related to the Protection of Groundwater Quality

Statutes	Investigations/detection				Correction			Prevention				
	Inventories of sources[a]	Ambient groundwater monitoring	Groundwater monitoring related to sources[a]	Water supply monitoring	Federally funded removal actions	Regulatory requirements for sources[a]	Regulate chemical production	Standards for new/existing sources[a]	Aquifer protection	Standards	Other
Atomic Energy Act			X		X	X		X		X	
Clean Water Act	X	X	X		X			X		X	X
Coastal Zone Management Act											X
Comprehensive Environmental Response Compensation and Liability Act	X		X		X						
Federal Insecticide Fungicide and Rodenticide Act			X				X	X			
Federal Land Policy and Management Act (and associated mining laws)			X					X			
Hazardous Liquid Pipeline Safety Act	X							X			
Hazardous Materials Transportation Act	X							X			
National Environmental Policy Act					X						X
Reclamation Act											
Resource Conservation and Recovery Act	X		X			X		X	X		
Safe Drinking Water Act	X		X					X	X	X	
Surface Mining Control and Reclamation Act			X		X			X			
Toxic Substances Control Act			X				X	X			
Uranium Mill Tailings Radiation Control Act			X		X	X		X			
Water Research and Development Act											X

[a] Programs and activities under this heading relate directly to specific sources of groundwater contamination. Table 13 summarizes the sources addressed by the statutes listed in this category. [b] This category includes activities such as research and development and grants to the States to develop groundwater-related programs.

SOURCE: Office of Technology Assessment

Table 3. Relationship Between Sources of Contamination and Federal Statutes [a]

Sources	Federal statutes															
	AEA	CWA	CZMA	CERCLA	FIFRA	FLPMA	HLPSA	HMTA	NEPA[b]	RA	RCRA	SDWA	SMCRA	TSCA	UMTRCA	WRDA[c]
Category I																
Subsurface percolation		E										A				
Injection wells (waste)				F								A				
Injection wells (non-waste)												A				
Land application		D		F							A					
Category II																
Landfills				F							A, B			A		
Open dumps (including illegal dumping)				F							B					
Residential (or local) disposal					C											
Surface impoundments				F		A					A		A			
Waste tailings						A									A	
Waste piles				F		A					A		A			
Materials stockpiles					C											
Graveyards																
Animal burial																
Aboveground storage tanks		A		F							A			A		
Underground storage tanks		A		F							A			A		
Containers				F	C						A			A		
Open burning/detonation sites				F	C						A					
Radioactive disposal sites	A														A, F	
Category III																
Pipelines				F			A									
Materials transport/transfer operations				F				A								
Category IV																
Irrigation practices		C, E														
Pesticide applications		C, E			A											
Fertilizer applications		C, E														
Animal feeding operations		C, E														
Deicing salts applications																
Urban runoff		C, E														
Percolation of atmospheric pollutants																
Mining and mine drainage		C, E				A							A, F			
Category V																
Production wells						A						A				
Other wells (non-waste)						A										
Construction excavation		C, E														
Category VI																
Groundwater-surface water interactions		C, E														
Natural leaching										F						
Salt water intrusion/brackish water upconing		C, E	E													

Key: A = Requires compliance with specified Federal requirements (some programs in this group may be implemented by States if they meet certain Federal criteria).
B = Authorizes funding of optional State programs that address specific sources.
C = Establishes Best Management Practices (BMPs) or recommended procedures for certain sources.
D = Establishes Federal criteria that must be met in order to receive funds for specific projects related to a source of contamination.
E = Establishes a grant program to States (funds may be used at the State or local level to address contaminants or sources).
F = Funds Federal cleanup of contaminated groundwater and associated sources.

[a] NEPA does not apply to any particular source. The environmental impacts of projects involving the use of Federal funds may be subject to Federal agency review.
[b] WRDA does not apply to any particular source. The Act provides research funds to States. Projects may focus on particular sources.

Table 4. Key Options for Federal Technical Assistance to the States: Criteria and/or Guidelines

Detection

- for conducting reliable hydrogeologic investigations under different site conditions (e.g., for monitoring the flow system, sampling and analysis, and data interpretation).
- for addressing contaminants for which there are no Federal standards, including for mixtures.
- for setting priorities among sources and determining which sources they will monitor and inventory.
- for linking monitoring activities with analysis needs.

Correction

- for selecting and implementing correction action under various site conditions.
- for setting cleanup standards on a site-specific basis, incorporating such factors as the limitations and likely performance of technology and current and/or potential users.

Prevention

- for preventing contamination from all potential contaminating sources (e.g., for siting, design and operation, closure, and post closure).
- for reducing waste generation and promoting waste recycling.
- for considering prevention alternatives apart from those related to specific sources (e.g., for protecting aquifer recharge areas; for regulating the contaminating substances directly; and for establishing an institutional memory for the locations of sources, contaminants, and land uses).

Table 5. Key Options for Federal Technical Assistance to the States: Research and Development Activities

Detection

- On toxicology and the adverse health effects of contaminants that are being found in groundwater, with particular emphasis on the synergistic effects of mixtures of contaminants.
- On water quality standards for substances known to occur in groundwater that are not now covered.
- On the environmental and economic impacts of contamination.
- On less costly techniques for hydrogeologic investigations in general and, in particular, for conditions that cannot now be addressed adequately (e.g., fractured rock).

Correction

- On the behavior of individual contaminants in groundwater and, in particular, the potential for the chemical and biological transformation of organic chemicals.
- On chemical and biological reactions in fluids that would be necessary, for example, for the development of techniques for treating water with multiple contaminants.

Prevention

- On opportunities and mechanisms for preventing contamination, including ways of reducing the generation (e.g., by process or product changes) and disposal (e.g., through resource recovery and recycling) of potential contaminants.
- On incentives for preventing groundwater contamination (e.g., financial incentives to companies, low interest rates for construction loans, tax deductions, credit schemes, waste exchanges, spreading performance risks, modifying regulatory requirements with respect to unproven technologies, and bans).

Testimony of

Edwin H. Clark, II

Senior Associate
The Conservation Foundation

My name is Edwin H. Clark, II, and I am a Senior Associate at The Conservation Foundation and Director of its Water Resources Program. The Conservation Foundation is a non-profit environmental policy research organization located in Washington D.C. Among other projects, we, in association with the National Governors Association, are sponsoring the National Groundwater Policy Forum. This Forum, chaired by Governor Bruce Babbitt of Arizona, is attempting to develop a concensus among representatives from a wide variety of interests about what policies the nation should adopt to protect its valuable groundwater resources.

The Forum has 17 members. As I mentioned, Governor Babbitt of Arizona is the chairman. David Roderick, Chairman and CEO of U.S. Steel Corporation, and Dr. Jay Hair, Executive Vice-President of the National Wildlife Federation, are the vice-chairmen. The other members are Governors Anthony Earl of Wisconsin and Thomas Kean of New Jersey; William Reilly, President of The Conservation Foundation; Peter Cohalan, Suffolk County (New York) Executive; Charles Duffy, an Iowa farmer; Dr. Louis Fernandez, Chairman of the Board, Monsanto Company; Lena Guerrero, a Texas State Representative; Dr. Robert Harris, Center for Energy and Environmental Studies, Princeton University; Frank Loy, Chairman of the Board, Environmental Defense Fund; Dr. David Miller, groundwater hydrologist; John Miller, President, Standard Oil Company of Ohio; Dr. Ruth Patrick, Philadelphia Academy of Natural Sciences; John Quarles, attorney and head of EPA's Groundwater Research Review Committee; and Victoria Tschinkel, Secretary of the Florida Department of Environmental Regulation.

All of these individuals or their organizations are already substantially involved in dealing with groundwater contamination issues. In addition, representatives from EPA, the Department of the Interior, and congressional committee staffs (including the staff of this committee) are working with the Forum, and professional and interest group staffs have been briefed and are

being consulted as well.

The Forum, which began its deliberations in January, is attempting to define the elements of a truly adequate groundwater protection program, giving particular attention to the allocation of responsibility for various components of the program among different levels of government. Although it is too early for me to report on the ultimate conclusions and recommendations of the Forum, I appreciate the opportunity to share with you some thoughts on major policy issues involved in developing a truly comprehensive groundwater protection and management program.

For this discussion, I would like to focus on six major elements of a comprehensive policy. These six elements are:

- Goal Definition -- what is the overall goal of the program?
- Source Controls -- which potential sources of contamination are presenting the most serious threats to the resource, how should they be controlled, and who should control them?
- Resource Management -- what additional steps need to be taken to truly manage the groundwater resource in order to protect its integrity effectively?
- Sanctions, Incentives, and Enforcement -- what policies should be adopted to induce the various government and non-government actors to fulfill their roles in protecting and managing the resource?
- Remedial Actions -- what programs need to be instituted to deal with contamination problems once they have occurred?
- Monitoring and Research -- what monitoring and research programs need to be established to support the program?

Many of the difficult policy issues related to each of these elements will necessarily have to be resolved at the state or local level. Today, however, I would like to focus on possible federal roles and on some specific policy questions that Congress will have to face if it attempts to formulate a comprehensive groundwater protection statute. Let me first identify what I see to be the general issues Congress must address with respect to each of these elements, and then briefly comment on some of the more specific policy issues.

Establishing a goal: The basic question here is whether

Congress should establish a national goal for groundwater quality, and if so, what that goal should be, and how it should influence the actual implementation of any program.

Controlling Contamination Sources: Should the Federal government take action to control potential sources of contamination that are not being adequately addressed under current statutes? If so, how should the responsibility for these controls be divided among federal, state and local governments, and what type of controls are likely to be most effective and efficient?

Managing the Resource: Should federal involvement extend into establishing procedures for managing as opposed to just protecting the groundwater resource? If so, how far should the federal government go, and what should these procedures be?

Sanctions, Incentives, and Enforcement: What incentives or sanctions should federal legislation include to induce state and local governments to carry out their responsibilities to protect groundwater? Are there ways of providing incentives for the private sector to take protective actions outside of a traditional regulatory framework?

Remedial Actions: Is there currently a need to institute any programs in addition to those authorized under CERCLA which will provide a mechanism and the resources for cleaning up groundwaters that have already become contaminated?

Research and Monitoring: Is there a need to authorize additional research and monitoring programs, or to expand existing programs?

Finally, as with any federal program, particularly during these times of severe budgetary constraint, there is the question of how much money the federal government should appropriate to implement any new program.

Let me now return to look at certain of these policy issues in more detail.

Establishing A Goal: In any program or activity it is useful to have a well defined goal. Establishing a goal allows everyone to be clear on where the program is trying to go. In some cases the goal is an operational goal that directly determines what actions are taken and what standards are established. In other cases the goal is more of a hortatory goal, defining what we are ultimately aiming for even though we may never reach it. The Clean Water Act contains one of each. The "fishable, swimmable" goal has had a direct impact on water quality standards. The "zero discharge" goal has had less of a direct impact, but still serves a hortatory purpose, providing a rough guide for the general direction the program should follow.

Thus, there are two questions involved in establishing a goal. The first is whether it should be operational or hortatory. The second is what the goal should be. The second question is well addressed in the report on groundwater policy challanges recently issued by the The Environmental and Energy Study Institute. It was also one of the major issues addressed in EPA's original 1980 effort to define a national groundwater policy. Although the wording may differ, these and most other studies identify basically three alternative goals:

- o To protect all current or projected uses
- o To protect all possible uses.
- o To prevent any degradation.

There seems to be increasing support for the "non-degradation" goal, and it has already been adopted in some states; for instance, Wisconsin, Maine, and Montana. Such a goal has several operational problems. In some cases its meaning is not clear; for instance, does the addition of clean water to an already polluted aquifer constitute "degradation"? If not, the term needs to be defined to mean something other than just a change from the current conditions. Moreover, how meaningful is a non-degradation goal if all potential sources of contamination are not being controlled? Finally, how does one enforce a non-degradation goal? To do so would require knowing the current

quality of all groundwaters -- something that we do not know and are, practically, unable to determine. For these and other reasons, non-degradation would perforce have to be considered a hortatory not an operational goal.

Controlling Additional Sources: In its excellent report, the Office of Technology Assessment identified a wide range of potential sources of groundwater contamination, most of which are currently subject to few if any controls at the federal, state, or local level, even though some are known to be causing widespread contamination.

What role should the federal government be playing in attempts to control these sources? Many would seem to be primarily the responsibility of state and local government. For instance, with sources such as septic tanks there appears to be very little that the federal government could do to impose controls. And sources such as irrigation seepage and mining may only pose threats in certain parts of the country, making national standards perhaps less appropriate. In these cases the question becomes whether the federal government should attempt to force state and local governments to take action, and if so, how?

For those sources that might be controlled, at least in part, under federal legislation, the question becomes whether the controls should be implemented under the patchwork of existing statutes, or whether a new, complex and possible duplicative regulatory program should be developed. As one example, there would seem to be little advantage to enacting a new program to control pesticides -- EPA already seems to have all the authority it needs under FIFRA. But should Congress establish new mechanisms to ensure that these programs are being implemented appropriately to protect groundwater? And what about sources, such as fertilizer, which are completely unaddressed by current regulatory programs? Should new regulatory programs be established to control such sources or should they be included in some existing program? Finally, to the extent that different programs are involved, is there any way to ensure that all these

controls are being implemented in a coherent and consistent manner?

The final policy question in controlling inadequately addressed sources is what kinds of controls should be implemented. Should the sources themselves be controlled through technology or performance standards, or should the primary emphasis be placed upon land use controls? There is probably no right answer to this question. In most cases a combination of source and land use controls will probably be more effective and efficient than either alone. But the most desirable combination will vary from one type of source to another, and from one part of the country to another.

Certainly the federal government is unlikely to become directly involved in establishing land use controls. The challange then is for it to create proper incentives to force states or localities to take necessary protective actions while allowing them sufficient flexibility to ensure that these actions are effective and efficient.

Managing the Resource: Federal efforts to protect groundwater have tended to focus primarily upon what the goal of the program should be and what measures should be taken to prevent contamination from various sources, placing relatively little emphasis on how the resource itself should be managed.

A comprehensive groundwater resource management program would appear to require several elements. The first is an adequate definition of the resource itself, and the uses that are currently being made of it. In many cases we have only very limited information about the characteristics of our aquifers, the groundwater in them, what they are being used for, and what threats they face. Both EPA and the US Geological Survey have major roles to play in assisting the states in this definition process.

A second element is an operational plan determining how the resource is to be used. So far, the only element of this plan

that has been proposed at the federal level is an aquifer classification system. But EPA's proposed classification system provides only a hesitant start towards a true resource management approach. It is a reactive, not an anticipatory scheme. Classification decisions are only made after someone proposes to site a facility over which EPA has some control. It would seem to be much more efficient and effective to classify aquifers (and their recharge areas) in advance to provide guides for better planning and more rational development patterns. EPA probably does not now have the authority to require states to undertake such a classification program. Should Congress make it a component of any new groundwater protection initiative, or ought this to be within the discretion of the states?

The debates over EPA's classification proposals have raised a whole series of other issues that Congress may have to address. Fundamental to all of these is the role that a groundwater classification scheme should play in managing the resource. Some have expressed serious misgivings about the whole concept of aquifer classification, fearing that it allows large areas to be written off as dumps for civilization's wastes. But aquifer classification should not be considered an end in its self, it is only a tool that should be used in implementing a comprehensive protection and management program, and in setting priorities. If the resource is to be managed in an effective manner, there is probably no alternative to an aquifer classification scheme, but establishing such a scheme is not the same as establishing a management program.

A major purpose of an aquifer classification system is to define what source and land use controls should be implemented in different groundwater recharge areas. Once this link is made, the question arises whether it is also necessary to establish ambient groundwater standards for the different classes. There is currently a great deal of confusion and controversy about such standards and what their role should be. Many seem to assume that MCLs issued under the Safe Drinking Water Act are ambient

groundwater standards. This should not necessarily be the case. These standards pertain to treated water distributed through a water supply system. They are not intended to apply to the source of water that this system uses. There might be good reason to have the ambient standards either more stringent or less stringent than the standards at the tap.

Do we really need a whole new set of water quality standards? A number of states emphatically answer yes. In some cases states have already enacted statutes that call for such standards and they need help in determining what these standards should be. Even where such standards are not required, they can be very useful in managing the resource, for they provide a clear touchstone for determining when there is a problem. Without quantitative standards it becomes very difficult to judge when any contamination is sufficiently serious to require action. Ambient standards provide both that signal, and a basis to justify taking action against sources of contamination that might not otherwise be adequately controlled.

If there are to be standards, the question becomes who should set them and whether they should they be uniform across the country? Attempting to implement uniform national standards would create a number of difficulties. On the other hand, having each state attempt to proceed independently through the standard setting process is, at best, very inefficient. Can the federal government contribute to this process in such a way to facilitate the states' efforts to set standards while allowing them the necessary flexibility to relate these standards to local conditions?

Perhaps the most difficult policy question involved in efforts to manage the resource is how groundwater quality controls should be integrated with other government programs affecting groundwater. Two of the most obvious links are: 1)that between groundwater quantity and groundwater quality, and 2) that between surface water quality and groundwater quality. The former is a problem because groundwater withdrawals can draw

contaminants into, or speed the rate at which contaminants spread through, an aquifer. Any groundwater management program must be considered incomplete if it does not make some effort to integrate the management of both quantity and quality. On the other hand, managing withdrawals is clearly a state responsibility, and one which Congress could address only with the greatest sensitivity and diplomacy, if at all.

Similar though less obvious connections exist between surface and ground water. Surface waters are a major recharge source for many aquifers. And groundwater is the major source of low flows in many of the nation's streams. Will there be, should there be, any effort to integrate these programs?

These are only some of the issues that Congress will have to address as it considers the need for and dimensions of a comprehensive groundwater management and protection program. They and others are being addressed by the National Groundwater Policy Forum. Although I cannot at this time indicate what the conclusions and recommendations of the Forum may be, I believe that they will be available in time to assist the Senate in its deliberations. In the meantime, we will continue to keep your staff informed of how our efforts progress, and we would be delighted to receive any insights you have on these issues.

I thank you again for the opportunity to share these thoughts with you today,, and would be happy to attempt to answer any questions.

GROUND WATER CONTAMINATION AND PROTECTION

THURSDAY, JUNE 20, 1985

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON TOXIC SUBSTANCES AND
ENVIRONMENTAL OVERSIGHT,
Washington, DC.

The subcommittee met at 10:08 a.m., in room SD-406, Dirksen Senate Office Building, Hon. Dave Durenberger (chairman of the subcommittee) presiding.

Present: Senators Durenberger, Abdnor, Mitchell, and Burdick.

OPENING STATEMENT OF HON. DAVE DURENBERGER, U.S. SENATOR FROM THE STATE OF MINNESOTA

Senator DURENBERGER. The hearing will come to order.

This morning we are holding the second in our series of hearings on ground water contamination and protection. We will be reviewing several ground water protection programs designed and administered by State and local governments. Our witnesses represent the States with well developed and effective protection programs.

I am not going to make a lengthy opening statement this morning. In the question and answer session I am going to explore the role of aquifer classification, ambient water quality standards, and other regulatory strategies in State programs. I know our witnesses have thought through these questions, and we will benefit greatly from the experience they bring to those issues.

One footnote I would make before we begin. On Monday the House passed a reauthorization and amendments to the Safe Drinking Water Act. I want to congratulate Henry Waxman and Ed Madigan for their efforts on that bill, and assure all of you that we will do our best to resolve the differences between the House and Senate versions quickly—I have already talked to Henry about that—and get the bill to the President. I imagine we will have some substantive discussion fairly quickly.

I will place the statements of Senators Mitchell, and Baucus in the record at this point.

[The statements follow:]

OPENING STATEMENT OF
SENATOR GEORGE J. MITCHELL

SUBCOMMITTEE ON TOXIC SUBSTANCES AND
ENVIRONMENTAL OVERSIGHT
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

JUNE 20, 1985

Mr. Chairman: I would like to commend you and other members of the Subcommittee on Toxic Substances and Environmental Oversight for initiating this comprehensive series of hearings into the important problem of ground water pollution.

I would also like to thank the Chairman for his willingness to allow me to participate in this hearing. Although I am not a member of the Subcommittee, I share your deep concern for the protection of the ground water and drinking water resources of the country. I hope to have an opportunity to attend several of the hearings on this issue scheduled for later this summer.

Last week, the Senate voted overwhelmingly to reauthorize the Clean Water Act. A number of important additions and adjustments were included in the Senate bill, but the basic design of the Act was not changed and has not been changed since it was passed in 1972. While several witnesses at the first hearing in this series pointed to the differences between programs for the protection of surface and ground water, I believe our experience with the Clean Water Act can offer some insights into the design of Federal and State programs for the protection of ground water.

One of the enduring aspects of the Clean Water Act is its comprehensive approach to the protection of surface water quality. When the Act was first developed, our surface waters were protected by State programs of varying quality and a patchwork of Federal programs. The Act spelled out clean water goals, defined the roles of States, Federal agencies, and private parties, and established administrative and regulatory mechanisms for control of water pollution from a range of sources. While there are always improvements to be made, the Act has provided an overall framework for effective coordination of surface water protection programs for over a dozen years.

Today, we see growing evidence of the scope and seriousness of the ground water pollution problem. My home State of Maine recently developed a program to deal with ground water pollution. While Maine has not had to deal with ground water pollution on the scale found in some other parts of the country, the problems which do exist, such as leaking

underground storage tanks, are magnified by the high percentage of people relying on ground water for drinking water.

The Federal and State governments have taken substantive steps to address these problems. Federal hazardous waste and Superfund programs provide for ground water protection at many sites. These programs are an important element in our protection of ground water, but they address only a small percent of pollution sources.

A number of States have developed impressive programs for the protection of ground water. I look forward to hearing more about these programs today. I am particularly interested in hearing from the States what they feel the Federal government should be doing to support and complement their programs. Which aspects of ground water protection demand Federal attention and support and which aspects are best handled by the State or local government?

While ground water programs in some States are of a high quality, other States have very limited programs. From the national perspective, these programs offer uneven protection of ground water. In addition, coordination of Federal and State programs is haphazard. Perhaps most importantly, we lack a clear and comprehensive statement of national commitment to ground water quality and an articulation of goals to guide Federal and State programs. This situation is roughly analogous to the condition of Federal and State surface water programs in the early 1970's.

I understand, Mr. Chairman, that you indicated at the hearing on Monday your intent to develop national ground water legislation for introduction later this fall. I believe that these hearings will highlight the need for ground water legislation and that an important objective of such an initiative should be establishment of a framework for the effective coordination of Federal and State ground water protection programs. I look forward to hearing the views of witnesses at these hearings and will do whatever I can to help in this important effort.

TESTIMONY BY

SENATOR MAX BAUCUS

GROUNDWATER HEARING

JUNE 20, 1985

Mr. Chairman, groundwater is an important resource that is often taken for granted. We just expect that we can sink a well and get good potable water.

We are slowly coming to realize that this resource is becoming increasingly threatened.

Hazardous waste is obviously the major threat to groundwater.

But it is not the only one. Leaking underground storage tanks, oil and gas drilling, mine waste disposal, septic tank pollution, and the mis-use of pesticides threaten the nation's aquifers.

These problems are becoming increasingly commonplace.

But the ___ extent varies throughout the country. Different states have taken different steps to address the problem.

It is the state programs that we will learn about today.

The federal government has only dabbled in groundwater. Now we must face the tough question facing us is -- what is needed on a national level to comprehensively address groundwater.

What we learn today about state problems, state programs and their effectiveness will determine how Congress should move forward.

Groundwater is an extremely difficult resource to address.

In some ways, groundwater is like the land surface in that it is everywhere. But vary

beneath the surface as different unconnected layers extend for great distances in all directions.

At one point, groundwater recharges a stream -- and is therefore, covered by the Clean Water Act.

In another instance it is far beneath the surface -- subject to pollution from underground injection of waste.

In still other instances, it is a shallow resource subject to pollution from leading septic systems.

The extent and diversity of the resource makes it a difficult resource to protect. We don't even have good data to identify the extent of groundwater pollution problems.

Clearly, states must take a lead in addressing the problem.

But that doesn't mean there isn't a role for the federal government.

Drinking water -- or water for human consumption -- is the most important use of groundwater.

Congress has clearly stated its intention to see that public water supply systems provide pure, healthful water. Congress, by its recent action, has reiterated its support for safe drinking water. Any groundwater legislation needs to place a goal of insuring safe healthful drinking water at the apex of water use.

We need to do more and a better job of setting standards.

But at the same time, the most critical need facing states needs to be addressed. That need is the need for data beyond those contaminants for which drinking water standards have been promulgated.

The federal government needs to do more to identify contaminants and safe levels of exposure to these contaminants.

States then need the flexibility to determine what level of protection is necessray to allow for the intended uses of the groundwater.

Clearly, EPA needs to do more to identify health concerns of groundwater, they need to vigorously enforce the laws that Congress has enacted to protect groundwater and the geological survey needs to better define the resource.

Beyond that, Mr. Chairman, we need to turn to the states and to follow their lead.

I am convinced that we can only succeed in addressing the groundwater problems facing this nation if we listen carefully to the states.

Each area faces unique and different problems. It is this flexibility that we need to recognize.

Today's hearing represents one of the most important days of testimony we will have regarding groundwater. I plan to listen very carefully to what they have to say.

The groundwater problems facing us are real. They are rapidly increasing. Federal action is needed.

But moving too quickly will only lead to false starts, and an unresponsive or misdirected attempt to solve the problem.

It is my hope that this committee will take a slow, deliberate approach to the problem.

Mr. Chairman, I look forward to working with you to address this critical issue.

Senator DURENBERGER. With that, we will turn to our witnesses. Peter Cohalan, Suffolk County executive, and Denise Fort, director of Environmental Improvement Division, State of New Mexico.

Peter, you are first on the list. You may proceed. We have 8 minutes for your statement. Your full statement will be made part of the record.

You get points for finishing within 8 minutes. I won't tell you what happens to you if you don't make it.

Mr. COHALAN. I will give it my best shot.

STATEMENT OF PETER COHALAN, SUFFOLK COUNTY EXECUTIVE, HAUPPAUGE, NY

Mr. COHALAN. Good morning, Senator Durenberger. As Suffolk County executive, I bring you greetings from our county, which is the largest county in New York State, outside of New York City, with 1,300,000 people, which is larger than 13 States, and we are on the east end of Long Island.

Almost all of our residents and people who use our county as a summer community depend on the fresh water stored in a series of unconsolidated water-bearing sediments for drinking, irrigation, and process water. So on behalf of our residents, I want to thank you for inviting us here today.

Our interest in ground water protection predates that of most other areas of the United States. Long before the Environmental Protection Agency declared Nassau and Suffolk ground waters a sole source aquifer, we recognized the importance of protecting our underground reservoirs. On Long Island our concern initially focused on quantity; that is, the volume of water in the ground water reservoir and the location of withdrawals that could be sustained without causing unacceptable salt water intrusion, loss of base flow to streams and wetlands, and diminution of underflow to the bays. As higher than permissible nitrate concentrations forced the abandonment or deepening of a number of shallow public supply wells, and as we began to find a wider range of contaminants, our primary concern shifted from volume to water quality.

Today we have to be concerned with both issues, quality and quantity. Our current thinking in Suffolk County reflects what we have learned from several sources: Years of working with the U.S. Geological Survey, a 1970 State assisted county water supply study, the landmark 208 Program, subsequent EPA and locally funded investigations, and, of course, our own experience.

Our ground water protection policy in Suffolk County is essentially the same as that recommended in a report completed by the Long Island Regional Planning Board in 1978 entitled the "Long Island Comprehensive Waste Treatment Management Plan." It focuses on the protection of public health and the fresh water dependent environment. It can be characterized as a policy of minimal degradation—of the prudent use, rather than the unthinking abuse, of a critical resource.

Quite simply, our policy in Suffolk County is to use every available means to prevent the impairment of our ground water and to clean up or contain known contaminant sources and plumes whenever it is technically and economically possible to do so.

To adopt a policy of absolute nondegradation, while politically attractive, would be both unrealistic and hypocritical. Such a policy would require an either/or set of actions. Either it would not allow for any human activities or we would have to develop and implement a set of fail-safe mechanisms to prevent contamination caused by human activities from reaching the ground water.

Our management strategies in Suffolk County are based on our understanding of the vulnerable characteristics of our ground water. We think we are both pragmatic and flexible in our approach.

We try to ensure a high level of protection from point and nonpoint source contamination throughout our county, and for an even greater level of protection in the critical deep flow recharge areas. The Pine Barrens of Suffolk County is a deep flow recharge area containing a considerable reservoir of excellent quality water. We must provide special protection to deep flow areas because of the significant downward component of ground water. The ground water carries recharged precipitation and waste water containing dissolved or suspended contaminants which have been deposited, spilled, or leached at or near the land surface. Water and associated pollutants that reach the deeper aquifers remain in the Long Island ground water system for hundreds, even thousands, of years, and they pose a significant long-term threat to our water supply.

The county cannot condone activities or practices that are likely to condemn us or our future generations to the consumption of poorer quality water or to the necessity for expensive wellhead treatment. To the extent that Federal and State law and implementing actions provide good control of contaminant sources, Suffolk is pleased to defer and even to assist whenever possible. However, to the extent that a locally significant source is inadequately addressed or ignored, the county will make every effort to deal with the resultant water problem.

Our implementation techniques are varied. They include, but are not limited to, intergovernmental and interagency cooperation; the provision of public information and public education; the construction on withholding of public works; other types of monitoring; and regulation.

Suffolk County cooperates with Federal, State, regional, and municipal lawmakers and administrative agencies that are interested in or responsible for the protection of ground water.

Suffolk County supports Federal and State legislative and regulatory initiatives that appear compatible with our protection goals. And we even provide expert testimony when needed to defend municipal ground water protection measures.

The county also has ground water planning, monitoring, water supply, and waste water management programs. Our department of health services maintains a network of monitoring wells, a State-certified laboratory with extensive and analytical capability, and a computerized data management system.

Regulation of contaminant sources has taken two forms: The enactment of local laws by the Suffolk County legislature and the adoption of new or amended provisions of the sanitary code by the Suffolk County Board of Health.

A few examples of those are:

In 1970, the county passed county law No. 21 banning the sale of laundry products containing detergents. Within 1 year, the New York State Legislature followed suit with a similar statewide ban;

In 1979, the board of health adopted article 12 regulating the handling and storage of gasoline and other toxic and hazardous materials. The provisions of this article have served as a model for other jurisdictions concerned with the prevention of leaks and spills;

In 1980 the board adopted article 6 of the sanitary code which reduces potential contamination from onsite sanitary systems by increasing the minimum lot size required for approval of these systems located in the two hydrogeologic zones with the best quality ground water.

In Suffolk most ground water pollution emanates from a multitude of nonpoint sources located throughout the county. Ground water protection measures are preventive in nature and are designed to eliminate, reduce, or contain pollution associated with septic systems and fertilizers, landfills, deicing salts, hazardous materials and waste disposal, and accidental spills and pesticide applications. Evaluating the effectiveness of these protection measures is difficult if not impossible. Unfortunately, the cost of protection is more readily discernible, and more frequently discussed, than the value of the health or environmental crises or long-term degradation avoided.

I am happy to be here with you today to present my perspective on ground water protection. I am both optimistic and concerned. I am optimistic because we in Suffolk County have increased the level of awareness among all of our residents as a result of what we have learned about ground water in the past 10 years. We are willing to commit county tax dollars, as we have, especially for deep recharge area open space acquisitions. Many of the essential elements of a protection program are now in place and functioning.

But I am concerned because we can't do an effective job without more long-term participation of other levels of government. Ground water protection is too big a task for any one level of government.

We believe that Congress should provide an overall framework for ground water protection. It should fund and oversee research of national importance focusing on such matters as contaminant risk assessment, pollution reduction and remediation techniques, and legal impediments to the effective enforcement of ground water protection measures. And to the extent that it is possible, it should support successful Local Protection Programs and promising pilot projects.

The States should bear the primary responsibility for ground water protection. Some already do. Where States, or even counties, already have effective programs, they should not be constrained or undercut by overly rigid or overly simplistic Federal laws or regulations.

Let me cite one example of this possibility. On Long Island we are troubled by the implications of the National Ground Water Protection Strategy since we see our aquifers as comparable to class I waters. Our ground water is irreplaceable and currently used by a substantial population.

Senator DURENBERGER. If you could summarize.

Mr. COHALAN. I guess my timing is excellent because my last line is we should remember the words of Benjamin Franklin who said, "When the well's dry, we know the worth of water." We worry that the well will go dry if we don't protect our water. Thank you.

Senator DURENBERGER. Thank you very much.

Miss Fort?

STATEMENT OF DENISE FORT, DIRECTOR, ENVIRONMENTAL IMPROVEMENT DIVISION, STATE OF NEW MEXICO

Ms. FORT. Thank you, Mr. Chairman. I do appreciate the opportunity to appear here. I think our State's Water Quality Protection Program is exemplary, but I will also confess to a few areas where it may not be working as well as it should.

In our State, water has historically been recognized as a resource which is limited, critical, and basic to the well-being of the State. That is because it goes without saying our State is a very arid State, with a small population, with the fifth largest land base in the country.

Our early concern, like that of the county representative, was over water quantity. But that was followed in 1967 by the adoption of the Water Quality Act which addressed surface water and also left room for ground water protection.

In 1977, the State adopted a series of ground water regulations, a copy of which I have brought here for the use of the staff.

Protection of ground water quality is imperative in a State where 90 percent of the water used in public water supply systems comes from ground water sources and where in many areas of the State the only source of water is ground water.

The Regulatory Program which was adopted in 1977 has two principal facets: The setting of ground water quality standards and the application of these to an individual discharger by means of a permit called a discharge plan. The burden of proof is kept on the discharger throughout the permitting process.

Regulations apply to many areas other than simply toxic waste sites, of course, because we found that ground water problems can be caused from all sorts of operations. They apply to well injection, seepage from surface impoundments or leach fields, land application of wastes, and any other discharges of effluent or leachate which may impact ground water, except those specifically exempted.

I have brought along a history of our experience in adopting these ground water standards and an example of the sort of discharge plan analysis which our State agency did on Mobil Oil Corp. proposal for their uranium leaching operation.

Dairies, as an example, with their manure lagoons and domestic septic tanks that are too closely spaced can cause a rise in nitrates in local ground water which in turn can cause the 'blue baby syndrome' in infants. We have recently released a copy of the detailed study done on the impact of our dairy belt operation on nitrates, which I will leave here.

We have a very important report on petroleum product contamination. New Mexico, like other States, is experiencing problems with its petroleum products. We are an oil and gas producing State

and we have operations, bulk storage terminals, and so on, which have led to severe ground water problems.

The basic regulatory pattern which is followed in these regulations is to protect ground water with a total dissolved solids content below 10,000 milligrams per liter, so any water below that level is protected. We don't protect that above 10,000. But we have a very liberal belief that water may be usable up to 10,000 TDS. We do permit limited degradation of water up to the ground water standards. If the existing concentrations already exceed the standards, then no degradation beyond the existing concentration is allowed.

We impose a performance standard on dischargers. We do not require specific design, construction and operation requirements for reasons that I will get into later as I talk about what I think the Federal role ought to be.

As I mentioned, the burden of proof is kept on the discharger throughout the permitting process.

Our effectiveness in preventing pollution since the adoption of these ground water regulations in 1977 has been extremely successful in preserving the State's ground water quality. We have had some instances where operations have begun to leak, but the monitoring systems which we have required have detected contamination and we have been able to take steps to correct that contamination.

At the same time, it should be noted that effective application of the regulations depends to a large degree on the political will and adequate staff and financial resources to address ground water pollution, regardless of the source.

New Mexico's regulatory restraints have not been applied as stringently as might be desired to the oil and gas industry in the past. A new and more environmentally oriented Energy and Minerals Department, at Governor Anaya's direction, has begun to address considerable effort to ground water protection at oil and gas facilities. We are seeing these facilities brought under permitting and finding better documentation of what is happening there in remedial plans to take care of some of the pollution which has occurred in the past.

A second exception is that for irrigated agriculture where it is specifically exempted from the regulations unless the irrigation water is received directly from the sewage system. As a result of that exemption, our agency has relatively little information about potential ground water pollution problems occurring with irrigated agriculture, although I would point out that is a small component of our overall agricultural industry.

A third area that surfaced recently as an unaddressed potential source of ground water contamination is that of landfills used for disposal of liquid wastes, some of them hazardous. What we have basically found is we have a number of potentially conflicting or overlapping regulatory schemes with no regulatory agency taking the initiative to address lagoons at landfill sites.

Our problem in these ground water regulations has come more from what they did not cover, and that is pre-1977 operations. The regulations permit us to address pre-1977 operations insofar as we have the resources to do so. The State resources to do so have been

slight; and secondly, while one doesn't want to grandfather in existing operations, as a matter of actual administrative reality, in applying our regulations, it has been much more difficult to do so with pre-1977 operations.

We have requested money from the legislature and are, as much as possible, getting to the existing regulations, but they are in an area where we are less sanguine about how well our protection is working.

We have used numerical standards for a number of pollutants, and we have 27 parameters which are now covered. We are looking at adopting standards in several other areas related to gasoline contamination.

But we have an overall toxic pollutant provision which has been useful in the State to permit us as operations come in dealing with chemicals or toxic materials for which we haven't yet established parameters, we have the ability to adopt standards as we need them. It works in a small State. I am not sure it would work for the Federal Government.

Let me turn then to the State's perspective on the Federal and State role. The State of New Mexico endorses a strong Federal role in ground water protection. I say that strongly, but I say it with several caveats which I think have been mentioned.

I do endorse a Federal role because I believe that just the same as with other major environmental areas, the States do not want to be competing with each other to see who is a pollution haven.

In our instance, where we have strict ground water protection standards, we don't want to see industry going to other States because the ground water protection standards are less stringent. We never want to be engaged in that kind of competition.

We also share the costs of cleanup. While Superfund has been of little use to us in the State because of the petroleum exemption and other issues we do thrcugh our passed on taxes and so on share the cost of cleanup for ground water pollution which occurs in other States. For that reason we would like to see other States applying stringent ground water protection.

My caveats depend on what I think is special about protection of ground water. The occurrences and characteristics of ground water depend very strongly on site-specific environmental factors, such as geology, hydrology, topography, and precipitation. The profile of principal contamination sources varies widely for each State as well. We would be very hesitant to see a detailed national requirement for a regulatory system that might be appropriate for a State with high rainfall but would be completely inappropriate for our State.

As an example, and I will finish up very quickly, a pond liner which is adequate for one site might be completely inadequate for another site with more permeable underlying soils and a more transmissive aquifer containing high quality ground water. On the other hand, that same liner might be unnecessarily expensive for a third site where depth to highly mineralized ground water is several hundred feet and the intervening formations are virtually impermeable.

I am sure that every state which has appeared before you or is likely to appear before you would point out that EPA has played

an important role in the standards setting process, in promulgation, in providing medical information for the States to use in the standards setting process, and support for data management. We appreciate those roles. We are not interested in getting into a paper-pushing exercise with the EPA, as we fight off detailed requirements which we think are inapplicable to our system.

Thank you.

Senator DURENBERGER. Thank you very much.

Mr. Cohalan, you referred to the adoption of a prohibition on storage and discharge of certain toxic and hazardous materials within the deep flow recharge area. It seems there is now wide recognition that these types of activities are not compatible with clean ground water, which is not the case with a number of other point and nonpoint source activities.

Have other efforts been made to restrict other activities, including nonpoint types, which could contribute to contamination of vulnerable areas?

Mr. COHALAN. Yes. We have dealt with a number of different types of things that would reduce the use of toxic and hazardous materials in the county. We have had success with them. We have done them both through our county board of health and also on occasion through the operation of the Suffolk County legislature. Some of the towns in our county have also dealt with this matter.

As we are a sole source aquifer and we sit right on top of an awful lot of water, we are very concerned about the possibility of eventually damaging our water supply. There has already been some damage over the years because of the tremendous increase we have experienced in population.

Senator DURENBERGER. What is the situation in New Mexico? Any strategies to restrict similar activities over existing or potential underground sources?

Ms. FORT. Which activities, Senator? Which sorts of activities?

Senator DURENBERGER. Are there restrictions on land use related activities? Do you propose certain activities over existing or potential underground sources of water?

Ms. FORT. Our scheme is a very comprehensive one. Any sort of operation is potentially subject, and that would go from a septic operation to a dairy to, of course, a lagoon used in oil and gas operations, or something like that. So our system is so restrictive that the standard is will it affect ground water? If it will affect ground water, it is regulated by the system.

Senator DURENBERGER. Mr. Cohalan, at the subcommittee hearing on Monday, the chief hydrologist of the U.S. Geological Survey showed us a map of nitrate contamination all over the country. He specifically showed us heavy concentrations in Long Island.

Would you describe for us the current state of ground water contamination from nitrates and from septic tank solvents in Suffolk County. Describe for us briefly what measures have been taken to address the problem from septic tanks which are already in the ground as well as those siting restrictions for new tanks.

Mr. COHALAN. The Upper Glacial Water Aquifer is no longer used in western Suffolk County for water supplies because of the contamination. We have taken some steps to try and protect our water supply.

One thing we did, for instance, was ban the sale of cesspool cleaners containing organic solvents and other additives that represented a threat to ground water quality.

We have been in the forefront in our desire to protect our water supply in many kinds of legislation, some of which, as I mentioned before, have become State laws.

In addition to being a major population center, we are also a major agricultural center in New York State. We are the State's largest agricultural producing county in terms of moneys that are generated by agriculture. We have had to ban and reduce the different types of fertilizer used in our county to protect our water supply from being poisoned.

We are presently in litigation with Union Carbide, over one of their fertilizers which we feel has the potential to damage our water supply in Suffolk County, and we are looking at working out a good arrangement where they will protect us in the manner in which they provide services to our farmers.

We are highly vulnerable to the misuse of our water. In the last 15 years, Suffolk County has enacted a number of very restrictive uses of water. We have gone to sewering and we have put in sewers in high density areas of the county—not without the scandals that always accompany New York State putting in sewers. We have put in sewers and we have limited the density of septic systems in other areas of the county.

These plus the efforts by our local towns to control land use, to upzone, to in some towns 5-acre zoning, 3-acre zoning, 2-acre zoning, to restrict the influx of population, are some of the ways in which we are proceeding to try to protect our water.

We believe in the local home rule sanctity of land use. We do not want the Federal Government or the State government or any other government to touch our local prerogatives on land use. But we do feel very strongly that because of the serious problems that exist with water, that we should have a Federal appearance in the matter of ground water protection. Even though we are very conservative on the issue of land use, we feel where ground water protection is concerned that there should be a Federal nexus.

Senator DURENBERGER. Thank you both very much. I have a series of general questions that relate to the Federal role and some other related questions that I would like to ask each of you to address in writing—we will make it part of the record—from your very different and yet very significant perspectives.

So we will propound those questions to you and then give you some time to respond to those for the record. I appreciate very much your being here today and what you are doing on behalf of ground water quality. Thank you.

Mr. COHALAN. Thank you, Senator.

Ms. FORT. Thank you.

Senator DURENBERGER. Our next panel consists of Mr. Charles Dean, chairman of the board, Tennessee Valley Authority; Ms. Victoria Tschinkel, secretary of the Department of Environmental Regulation, State of Florida; and Robert Moore, Ph.D., assistant deputy commissioner, Connecticut Department of Environmental Protection.

I welcome all of you, your excellent statements will be made part of the record. We will now proceed with Mr. Dean.

STATEMENT OF CHARLES DEAN, CHAIRMAN OF THE BOARD, TENNESSEE VALLEY AUTHORITY

Mr. DEAN. Thank you, Senator. I have with me today Dr. John Crossman from our environmental quality staff and Mr. Mike Matthews from our water quality branch. These gentlemen spend almost full time on water problems and are qualified to answer detailed questions if you need them.

It is a pleasure for me to testify before the subcommittee on TVA's interest in and experience with ground water protection. As a natural resource development and management agency, TVA periodically undertakes resource assessments in the Tennessee Valley.

A recent example of this type of initiative is a June 1984 staff report entitled "Ground Water Situation Assessment of the Tennessee Valley." TVA undertook this assessment because of the number of ground water contamination incidents that have been reported in our region over the last 7 years. We were also responding to the public's interest in ground water and a recognized need to determine the status of ground water quantity, quality and use.

In our assessment, TVA found a surprising dependence on ground water for drinking water, and incidents of unaddressed pollution that were both startling and unexpected. For example, although the Tennessee Valley is blessed with an abundance of water with an average annual rainfall of 52 inches, we are becoming increasingly dependent on ground water for such primary purposes as public supplies, rural use, and self-supplied industrial use. To illustrate:

Over 64 percent, almost two-thirds, of the region's residents rely either totally or in part on ground water for their potable water supplies.

Over 1.7 million residents in the region maintain an individual household ground water system, usually a well.

Ground water is used by nearly 3,700 community water systems, businesses, industries, hospitals, churches, campgrounds and schools.

Estimates of ground water withdrawals for the Tennessee River drainage area have increased by 51 percent in the last 10 years. More importantly, this trend is not expected to change in the foreseeable future.

TVA's survey of ground water conditions found that there are serious instances of ground water contamination in the Tennessee Valley. The sources of documented ground water contamination include pollutants from wastewater impoundments, improper solid waste disposal, coal mining activities, oil and gas exploration, agricultural activities, improperly installed and failing septic tanks, and general urbanization activities.

One of the most striking examples of severe ground water contamination is the Bowling Green-Warren County area of Kentucky. Leaking underground gasoline storage tanks and explosions have forced area residents to evacuate their homes because of the build-

up of gas fumes in their basements. Industrial wastes are also contaminating ground waters. The State has attributed these problems to leaking industrial pits, spills, industrial discharges to sinkholes, and offsite waste haulers. Although the Center for Disease Control has issued a public health advisory and investigations under Superfund have been initiated, cleanup is expected to be expensive and the potential for public health and safety problems will remain until ground waters and their recharge areas are cleaned up.

In the coal mining areas of Appalachia, portions of major aquifers have become degraded in quality to the point that they cannot be used for drinking water. This is particularly severe in area mining of shaly, pyritic coal. A recent survey conducted by the University of Kentucky of 147 water supply wells in one county in eastern Kentucky found that 44 wells began experiencing water quality or quantity problems within several years following the start of mining in 1980. Similar problems have been reported by citizens in Tennessee who noted that their well water turned red or orange from iron, tasted bad, or eventually went dry, even though they were several miles from the mine site. TVA feels that further investigations are needed to document the extent of ground water contamination occurring in the coal fields.

In addition to these concerns, a survey of local health officials indicates that counties with self-supplied wells have problems with fecal coliform contamination, possibly due to improper sewage disposal or improper facility construction. In one particular instance, approximately 30 percent of the 30,000 homes in a four-county area of western North Carolina had drinking water samples contaminated with bacteria.

Oil and gas exploration and production activities are also causing significant damage to ground water. Kentucky reports 700 contaminated wells in one county, with 200 wells rendered unusable because of brine wastes from the 1980-1983 oil boom. Although a state of emergency was declared, the problem remains unsolved.

Senator DURENBERGER. Why is that?

Mr. DEAN. Sir?

Senator DURENBERGER. You say a state of emergency was declared in 1982 or 1983 and the problem is unresolved.

Mr. DEAN. Yes, sir.

Senator DURENBERGER. What did they do, just keep closing up the wells and trucking in water?

Mr. DEAN. The state of emergency is related to the bringing up of these brine wastes with the oil and the intermittent overthrow of workers from holding ponds during rainfall events. In the particular situation where an emergency was declared a municipal water line was extended to the affected families. However, brine wastes remain a problem, in fact, sodium alerts are periodically declared for salty public water supplies, with over 60 percent of the State's supplies exceeding the standard for sodium restricted diets.

One of the other major findings of TVA's ground water assessment was the involvement, to some degree, of over 60 Federal and State agencies with ground water in the TVA region. This was not surprising since there are at least 16 Federal statutes that contain ground water protection provisions. Discussions with these agencies disclosed that there is little coordination or even communication

among many of them; consequently, there are inefficiencies, overlaps, fragmentation of responsibilities, duplication of effort, and a disproportionate emphasis on emergency response to contamination at the expense of upfront resource protection.

Over the course of TVA's survey, we found that existing data on ground water quality were primarily limited to inorganic nonmetals, metals, and bacteriological parameters. General assessments of regional ground water quality for extended lists of parameters, such as the EPA's 129 priority pollutants, have not been routinely performed in the past and are not currently being undertaken. More significantly, there are no plans for comprehensive assessments in the immediate future.

TVA did find a considerable amount of ground water data in various federal and state agencies' files. However, these data are difficult to access and are of questionable utility because of poor quality assurance. With the limited funding available to the different agencies, it is not surprising that quality assurance of ground water data is often poor, systematic data collection efforts are absent, data interpretation is limited, and many important water quality constituents are not analyzed. A cooperative State and Federal program for assessing the status of ground water quality and using that information to mount an effective protection program is urgently needed.

TVA supports EPA's Ground Water Protection Strategy and basic ground water policies as an essential first step in addressing ground water issues. However, EPA's ground water protection strategy acknowledges the inadequate nature of some State ground water protection programs and the inconsistencies that exist in EPA programs. It also tends to concentrate on after-the-fact actions to clean up contaminated ground water rather than upfront protection of the resource. Thus, many widespread sources of contamination are unaddressed. TVA believes a strong pollution prevention approach is an indispensable aspect of public health protection and the preservation of underground water supplies for future use.

A voluntary, guideline approach for State participation in ground water protection is also advocated in EPA's current strategy. Such a voluntary strategy will likely be inadequate to overcome the formidable institutional impediments that exist. Although some States will take the initiative and improve protection efforts, experience shows that others will be reluctant to undertake any new program except when public health is threatened or if there is a major resource crisis. To resolve this issue, we urge consideration of an environmental protection program that would be based, in part, on a strategy of minimum national requirements which states must meet. This approach helps assure consistency between States while protecting public health and safety and the environment. It also effectively discourages the creation of "pollution havens".

Review of the ground water situation in the seven valley States strongly suggests that this approach would be an effective way to assure adequate and consistent protection for ground water.

TVA also urges consideration of the unified management of surface and subsurface waters because of their interaction. We have found that during low flow conditions, subsurface waters make a substantial contribution to surface flows. This finding has also been

substantiated by others in the scientific literature discussing acid mine drainage, irrigation return flows, and nonpoint sources of pollutants. Because of this interaction, it seems that the management of both surface and subsurface water quality under one authority would help avoid the possibility of fragmented responsibilities and would make use of a proven mechanism to protect ground water.

We also will file a paper on the effects of fertilizers on ground water which was prepared by our Office of Agricultural and Chemical Development in Muscle Shoals. [See p. 166.]

Senator DURENBERGER. Thank you.

I want to say to our other two witnesses I am going to have to recess this hearing for at least 15 minutes, maybe 30 minutes. I have to be on the Floor right now in my capacity as Chairman of the Intelligence Committee.

You have come long distances to testify, and I don't want to call this thing off at this point. So if we can just take about a 15-minute recess and hope it doesn't extend too much beyond that. I would beg your indulgence.

[Brief recess.]

Senator Mitchell [presiding]. Senator Durenberger is momentarily detained and so we will resume the hearing.

I understand that Mr. Dean has already given his statement and there remains statements from Miss Tschinkel and Mr. Moore. May I ask that you summarize your statements. The full text will be inserted in the record. See if you can keep your remarks to 5 minutes each because we would like to have some time for questions.

We look forward to hearing from you.

STATEMENT OF VICTORIA J. TSCHINKEL, SECRETARY, FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

Ms. TSCHINKEL. Senator Mitchell, I am from the State of Florida. I am secretary of the Florida Department of Enviornmental Regulation.

As you probably are aware, Florida's ground water program is fairly stringent and among the strongest in the country. The reason for that is that 92 percent of our citizens rely on ground water for their drinking water supplies, and our aquifers, unfortunately, have proven very susceptible to contamination. They are very close to the surface and are overlain by porous rock or by sand in many areas.

Florida is not an industrialized State, so people are surprised to hear about the extent of our contamination. However, we do have about 6,000 surface impoundments and about 60,000 underground storage tanks of petroleum, 9,000 drainage wells, and about 246 sites of confirmed ground water contamination.

I brought the list that we keep to keep track of sites that we are searching around the State. I thought it might be of interest.

The State also uses more pesticides than any other state in the country, despite the fact we are only 33d in planted acreage.

I am just going to highlight a number of programs we have. But I think I would say that one thing we have discovered is that it is impossible to attack the ground water program on just one front. It

is important to look at protection of sources that are leaking and also we found it necessary to have ambient ground water standards and to set up a method for handling toxic chemicals. In other words, as I am sure you well know, it is a complicated problem and has to be handled by looking at a lot of different aspects.

Florida has adopted ground water standards, and we submitted copies of those standards and regulations. It is based on a classification system. It prohibits the introduction of toxic chemicals in toxic concentrations in all of the different levels of ground water. It relies on primary drinking water standards, but also will require secondary drinking water standards to be met in a number of the aquifers in question in about a year and a half.

The ground water standards seem to be working rather well. Our most stringent standard, which we call G–1, looks like it needs to be tightened up to protect high recharge areas, public drinking water supply areas, and other areas that are going to prove very vulnerable. We are working on some regulations at this time to tighten up that standard.

Our legislature passed a major Ground Water Quality Assurance Act in 1983, subsequent to the adoption of these ground water standards, to attack a number of other problems we were not able to handle.

First of all, they gave us authority and money for a major ground water monitoring network which is going to involve drilling about 1,400 new wells and sampling of 1,000 additional wells over the next 3 to 4 years.

This law also established a well field contamination program. It created a Pesticide Review Council, which I will mention briefly later. We have a statewide tank regulatory program that preceded the national one.

Sewage is a big problem in Florida. Our major pollutant in Florida is people. So we tightened up septic tank regulation, developed an intensive inspection program for package sewage plants, and established a fund for another $100 million for sewer construction.

We created a very popular program to promote the safe disposal and management of hazardous waste and have established a statewide program for the establishment of transfer and treatment facilities for hazardous wastes around the State.

The act prohibits disposal of hazardous waste into landfills in Florida. They are not appropriate in our State for very real geologic reasons. It requires permits for closure of sanitary landfills and also requires financial responsibility for landfills.

It also provided some $30 million over 3 years for cleanup of hazardous waste sites around the State. We are having very good luck cleaning up hazardous waste sites around the State, and particularly by responsible parties. Three are undergoing active cleanup. We have 48 sites being pumped for petroleum spills and 37 completed petroleum cleanups around the State.

We have a continual problem, however, in a couple of areas dealing with cleanup. First of all, a significant problem in our State and many States has to do with Federal facilities, particularly off-site, where the Federal facilities have used off-site disposal along with many other people but are not willing to come to the bargain-

ing table, taking sovereign immunity. We are very concerned about that.

Also, our State fund over time is not going to be sufficient. We are working on that.

A major problem is to try to provide safe drinking water for third parties that are injured through a spill, particularly gasoline spills. For people that are left with contaminated wells, we have money to clean up the contamination, but not to supply safe drinking water for those people in the meantime.

Two other items I want to mention have been very helpful. We adopted additional mean contaminant levels for drinking water in the State of Florida. We got tired of waiting for the federal rule promulgation process. Our concern with ethylene dibromide obviously led us to adopt one for ethylene dibromide, which we found in about 800 wells in Florida, but we have also adopted them for about seven other chemicals which we have found from time to time.

The final program that has been extremely helpful, particularly in allaying the fears of the public, is required testing for about 118 potential contaminants.

Let me just highlight a couple of problems that we have had. I won't go into a lot of detail and will wait for questions.

First of all, our experience with the standards has been very positive. People have been able to meet the standards, and the drinking water in general has looked very safe. But the testing by private analytic firms leaves a lot to be desired, so we have had to perform confirmations. Generally, the problem is that the firms have turned up false positives, which has served to alarm people, when in fact the drinking water has been perfectly safe.

A continual problem is jurisdiction over land use, a conflict in agency responsibilities, particularly in pesticides, which we already mentioned, lack of sufficient financial resources, and the problem with trend analysis, trying to figure out what is really going on and whether it is very serious, whether things are improving or not, because ground water is such a vast resource.

In the Federal area, there are a number of studies going on, as you know. The National Governors Association and the Conservation Foundation have a committee, a working group, which I serve on, chaired by Gov. Bruce Babbit, and the Environmental and Energy Study Institute has a ground water working group. We are hoping that will develop a consensus that might be of interest to you in looking at it.

However, in my view, I think we are going to need a ground water protection act. We are going to need more standard setting by the Federal Government for drinking water. We would like a Manhattan Project to get going on that because we are doing it on an ad hoc basis. We need additional research and development in the ground water management area, and many States need financial support.

We also need additional emphasis on nonpoint source pollution control, particularly pesticides and fertilizers. I think the Federal Government has a number of important roles it needs to play and expand on. We look forward to working with your staff and members of your committee in this area.

Senator MITCHELL. Thank you, Miss Tschinkel.
Dr. Moore, we are pleased to hear from you.

STATEMENT OF ROBERT E. MOORE, ASSISTANT DEPUTY COMMISSIONER, CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

Mr. MOORE. Thank you, Senator Mitchell.

I think Connecticut faces many of the same problems of the other States in the country. About a third of our population relies on ground water for its water supply. About half of those 1 million people rely on private drinking wells, with no benefit of any testing of them.

Ground water contamination has become an ever-increasing problem with the State. We have since 1978 involved ourselves in some close to 1 1,000 incidents of ground water contamination throughout the State.

The managing problems and trying to deal with our ground water program and to form that into a particular and strong program culminated in 1980 with adoption of statewide water quality standards. In trying to set up the program, we looked at the need for both prevention and pollution control or protection.

In terms of prevention, we looked at the goals of the statutes. We looked at the goals of the program. We found that our goals for surface water quality were consistent with our needs for ground water and chose to adopt them and integrate the programs of surface and ground water protection into a single combined program.

In doing so, we had to evaluate the ground water conditions and land use conditions throughout the State and mapped a variety of land uses and a variety of pollution control problems and mapped all of the hydrogeologic information available that would describe our ground water flow and our ground water system in the State.

With that in hand, we developed a classification system which set forth four basic quality standards. Two called GAA and GA deal with setting requirements for ground water used for drinking without treatment. These two classifications account for about 94 percent of the land area of the State of Connecticut. Two other classifications were developed also. One was the AGB classification, which was used to describe areas of existing contamination, areas where because of urban development or past disposal practices, those areas were already contaminated, and there was no overriding reason to clean them up. Those became a very small part, but a significant part, of our ground water program. We also set up a classification which we call GC, which is based on the hydrogeologic characteristics of the State and land uses. We found those areas are most suitable for those land disposal or waste disposal activities which required land, lagoons, hazardous waste sitings, ash deposits and landfills, and set those up for prospective siting. These are areas in the State that are most suitable for those kinds of practices.

Very difficult decisions were made in developing that particular classification, the most controversial part of the water quality standards program. In developing that classification of GC, we found that only three-tenths of 1 percent of the land area of the

State of Connecticut fell into that classification where we said siting could be acceptable. That is not enough land area to handle our garbage needs in 1990. It forces a major conflict and a major solution in other program areas.

In addition to the water quality standards which we use for our basic prevention program, the permit program—they are not the permit program; the permit program is separate—the quality standards do prohibit certain activities. But you have to go through the permit practices for consistency and for discharge in order to get permits for a discharge.

The pollution control parts of our program basically apply to both surface and ground water. So all the techniques that are available in surface water control were available for ground water control.

We did find there were certain things missing in our tools we needed to address problems that couldn't be done by existing programs. Those included banning of certain toxic substances or hazardous substances from septic system additives. Those regulations of banning those additives and substances from septic tank cleaners have been adopted.

Also, keeping with the widespread problem of leaking underground storage tanks, authority was enacted in 1982 to allow us to regulate those underground storage facilities. Those regulations are about to be adopted.

We also found that most of the problems dealing with incidents of ground water contamination were coming from very minor sources, sources we couldn't regulate on a statewide basis. In order to deal with widespread regulation of small sources, we felt we needed to put more authority in the hands of local government. So we enacted a law which would allow us to delegate additional State authority over pollution control to local governments. That also passed in 1982. That allows local governments to regulate even further some of the minor sources of ground water contamination.

We also felt that without control over the water use, we had no ultimate control over our ground water protection. We need to also be able to deal with withdrawal and quantity issues in order to assure that the prevention we had set up in the standards would be compatible with future uses.

We adopted a diversion or allocation program also in 1982 which would allow us to control and permit the withdrawal of ground waters and surface waters as well.

We also had the same situation as Florida. We had victims with no remedy other than cleaning up the sites, and the site cleanups would take, in many cases, several years. So we enacted a law which would allow us to order the installation of potable water and provide grants to municipalities to pay for that additional cost where we had no responsible parties.

I do have some comments on the federal role, if you would like to get into those later. My time is up.

Senator MITCHELL. Thank you, Dr. Moore.

Is Miss Fort still present?

Ms. FORT. Yes.

Senator MITCHELL. Would you come up and sit at the witness table so we can get your perspective on some questions which I will address to all of you and ask you to comment briefly on.

One of the first issues to be confronted in developing a national ground water protection program is to define a protection goal. That can be a difficult issue because two different aims must be accommodated. First is to establish a strong enough goal so the activities and programs that follow from it will be effective and disparities in levels of protection provided by States eliminated. The other is, of course, to allow sufficient flexibility and not to conflict with States and localities that have proceeded far in advance of the Federal Government in ground water quality protection. Therefore, I have two questions I would like to ask each of you to comment briefly on.

The first is what would be the purpose of a Federal ground water protection program? What should be the goal: public health protection, resource protection, or something else?

The second is that the zero discharge goal of the Clean Water Act has been a focal statement in directing regulatory activities. Should we have a similar purpose with respect to protecting our equally important ground water resources? What are your views on usefulness specifically of adopting a nondegradation goal to aim for in ground water protection?

Perhaps we could begin with Miss Fort and then proceed in the order that the other three witnesses testified on the second panel.

Ms. FORT. Thank you, Senator.

With regard to the goal of the ground water protection program, I think it has to look both at public health and also at protection of ground water for other purposes. Our State regulations do so. We look toward reasonably foreseeable use of ground water and, in so doing, apply that standard rather liberally because in a State as poor in terms of quantity of water as our State, we can't really afford to pollute much water at all. So it is a liberal standard, liberally applied.

With regard to a nondegradation goal, while the goal might be admirable, I think the experience is that use of ground water and subsequent effect on underground water is destined to affect the ground water. I think it is an appropriate standard as applied under RCRA, as applied to certain hazardous substances, to have a no discharge and no degradation standard.

I guess the representative from Florida said that the people are the greatest pollution problem, and as we are dealing with activities, such as septic tanks, and dealing with dairies, and many of the commonplace activities of everyday life in the State which do have some effect on ground water, we have chosen to permit degradation up to public health standards for common pollutants such as nitrates. Where there are more serious hazardous substances, we don't permit any pollution at all.

But I think a nondegradation standard would be difficult in application. We have not been able to use it in our own State.

Senator MITCHELL. Thank you. Mr. Dean.

Mr. DEAN. Yes, Senator. We in the Tennessee Valley feel like one of our functions is to define resources we have and talk in

terms of protecting them. So we feel if we protect the ground water resource, the public health would tend to take care of itself.

We find in our area, and I guess it would be typical of the United States as a whole, we have some aquifers that are so well isolated by the geology that it is very difficult to pollute them, which is a happy situation. We also have other aquifers in certain parts of our area that are associated with sinkholes and other geologic formations, that unfortunately make it rather easy to pollute them. So I think that we have to take into account that any criterion adopted would vary to some degree in application, depending on the geology involved, and that it is difficult to pollute the ground water in certain parts of our country. You can pump it dry, perhaps, but you can't really contaminate it with septic tank effluent or anything like that. In other places it is rather easy to pollute it. We think that ought to be taken into account.

Senator MITCHELL. Miss Tschinkel.

Ms. TSCHINKEL. Our law requires us to protect surface water and ground water for the present and future most beneficial use. Generally in Florida that would mean most of the aquifers are protected for drinking water supplies.

However, we do have very confined saline aquifers in some areas that are perfectly suitable for waste disposal, effluents, et cetera. In general we look to the highest and best use and protect the water for that purpose.

As for the nondegradation, I think Miss Fort said about everything I could say on that. It is simply not practical to have absolutely no degradation as an implementable feature of a regulatory program. However, I think it is extremely good to have it where it applies to toxic chemicals and practical to do that.

Senator MITCHELL. Thank you. Mr. Moore.

Mr. MOORE. Thank you. I think that the Federal role should be directly to protect the ground water as a resource in this country. I think one of the problems of the EPA strategy today is it deals with implementation of its strategy on a case-by-base basis. It doesn't allow for a widespread protection of the resource that Congress has required for the surface waters.

I think the resource is just as valuable, if not more. Congress should act to protect the resource as a whole, just as it has done with our surface water and air resources.

I also think if we don't set a national goal to protect it as a whole, then the case-by-case analysis implemented through the existing programs of RCRA and Superfund will lead to conflicts where States have chosen a different level of protection or a nondegradation program, for example.

In terms of whether or not we should have a nondegradation program, I think that a nondegradation program will be full of exemptions because of the way we get rid of waste in rural communities, in septic tanks, because of the ongoing need of land disposal, and plus the widespread use of pesticides and storage of chemicals in the ground. A nondegradation program that doesn't recognize those effects and those uses is going to be fraught with problems and conflicts and exemptions.

Senator MITCHELL. Thank you very much.

There are a number of questions that come to mind on the subject of the proper place for uniform guidelines or requirements, the kinds of regulatory tools provided by Federal statutes for air, surface water and specific sources of ground water contamination.

I am interested in your views on the need for uniformity with respect to three types of regulatory tools: aquifer classification, ambient or other types of ground water standards, and source controls. Let me ask them one at a time. First, aquifer classification.

If our objective is to protect the ground water resource, how is aquifer classification, which assigns different values or protection levels to the resources, compatible with such an objective?

At the hearing on Monday EPA's classification strategy was described as a reactive rather than anticipatory approach to resource protection. Do you agree with this statement? How can classification be used as a preventive management strategy? Finally, should classification be a required part of a federally supported State program as a basic means of assuring States have identified aquifers within their boundaries and established priority protections and measures?

Ms. FORT. I think the EPA strategy is a very limited one as it uses aquifer classification. We essentially look at the total dissolved solids. If the ground water is above 10,000 total dissolved solids, we don't extend our gorund water protection scheme to it, though under RCRA and other statutes we might end up protecting it.

I would agree with the characterization of EPA as reactive. It certainly isn't as far-reaching. It is not looking as far ahead on the use of ground water resources as we have to see in our State with our limited water.

Mr. DEAN. As far as aquifer classification, TVA operates in seven different States, as I mentioned earlier. We have a variety of aquifers and different amounts of natural protection are offered. I was referring earlier to the need for flexibility in this type of regulation.

I would also like to ask my experts here if they want to add anything to that.

Dr. CROSSMAN. We would also agree with Miss Fort in the characterization of EPA's classification as being somewhat reactive. We see a need for uniformity in the classification of ground water since aquifers don't reside within political boundaries. We believe that as a Nation we need to devise a uniform national classification system that could be adopted at the State level.

Ms. TSCHINKEL. We based ourclassification system on total dissolved solids. We are really trying to look at what the practicality of the future use might be. However, I do think that there is merit in looking at different systems differently.

For example, within the drinkable classification in Florida, we are trying to distinguish, for example, high recharge areas and large well fields which are substantial investments in the future by municipalities—for example, Dade County, where Miami is—and there we are going with very stringent types of regulations and trying to encourage land use regulations as well as purely discharge regulations.

So it seems to me that we are going to have to differentiate levels of protection if we are going to be able to give the maximum

protection to the most sensitive areas. That would lead to an unfair and unreasonable result in some less sensitive areas.

Mr. MOORE. Obviously, since Connecticut adopted a classification system to protect and prevent pollution of waters, I support classification to work for prevention.

What we have done is based the classification on use of the resource and the need to use that for different water supplies, with the primary goal being water supply. Then the other two classifications which say that there is a problem or there is not going to be consistency with the useful water supply are based on existing conditions and very selected small areas for waste disposal. So I think it can be used for prevention, depending on what your goal is.

If your goal is for drinking water, then this classification system will rotate around that particular goal.

Senator MITCHELL. The next series of questions deals with ground water standards. There is some uncertainty at this point as to whether there is any place for such standards in the Federal program. Some suggest that ground water standards are more pollution allowances than protection levels, looking at the experience with surface water proteetion, and the ineffectiveness of water quality standards led to the passage of the act.

However, many established State programs, including those represented here today, use ground water quality standards. Therefore, I would like to hear your views on whether such standards are a necessary element for quality protection programs.

How are standards used to prevent contamination rather than allowing a specified amount of pollution in an area? In your view, is the issuance of such standards a Federal responsibility or would guidelines or quality criteria be more appropriate? Finally, how much flexibility should States be given in setting the standards in order to avoid the creation of pollution havens?

Ms. FORT. Thank you, Senator. These are excellent questions. I am having trouble with them.

Thinking through this, we in our State use ambient standards, as you have noted, not technology based ones. I guess it seems to me how well the Clean Water Act has worked in the State might indicate that is a preferable arrangement with a State with a controllable number of dischargers, as our State is, rather than looking at technology based ones.

It has taken EPA so long in certain aspects, for example, of the Pretreatment Program to actually come out with a standard which does any good for some of our industries that we have gone ahead with the ambient standards and we think done a pretty good job with them at the State level.

What is different about ground water as compared even to surface water or air quality discharges is how important the geology of a specific site is. Our effort in New Mexico has been to move dischargers as much as possible to sites which are geologically good, where contaminants can be continued through natural measures. If a discharger insists on going forward at a certain site, we have ample teeth with the ambient standards to require triple lining of ponds, whatever else is necessary, to prevent ground water contamination at that site.

But we feel pretty strongly within the State that the use of ambient standards gives us the flexibility and gives the discharger the flexibility to come up with a good way of running the operation and properly siting the operation to avoid ground water problems. If we were to wait on a national, I shudder to think of the amount of time that would be required for EPA to come out with performance standards and so on on some very common sorts of everyday discharges that we are now successfully regulating on a site-by-site basis.

I do believe there is a national responsibility for the promulgation of those ambient standards. We, of course, want the ability for State standards to be more stringent where it is necessary. But precisely because of the concerns about pollution havens, because our State is one that we feel has fairly stringent standards in place already, and because the adoption of every stringent standard becomes an opportunity for people to say well, the standards are less stringent elsewhere and we will pick up our business and go elsewhere if you are going to impose those standards on us, it would be helpful to us as State regulators to have national standards to which to point and demonstrate the State is not out of line with the national standards we are using.

So we do support national standards, but feel strongly they should be performance, that they should be an ambient sort of standard where we don't have to go back and say for every facility of this sort, triple lining is required, as an example.

Mr. DEAN. We believe the Congress should consider performance based on national standards as a first step and if ground water degradation continues, then you should consider a technology based approach such as that adopted in the Clean Water Act.

The Federal role in standard setting would be to provide oversight on uniformity because we feel that the Federal Government has the resources—both technical and fiscal—to undertake the standard setting process.

Ms. TSCHINKEL. It is a complicated question. I am going to try to do a good job answering it.

I think the ambient standards have been extremely useful in surface water, despite what the view might be some places. Florida is very water quality limited, so even though we might put BAT requirements on the water discharger, it still might not protect our water quality standards and we have to require modeling and tightening up from the discharge.

Similarly with ground water. There are going to be sensitive areas where it would be impossible for the Federal Government to adopt technology based standards that would still protect our ground water supply. On the other hand, I don't think you can see tank regulations as anything but a technology based standard, and I think we have to recognize that there is going to have to be a requirement for certain types of technology and that the Federal Government might be in a lot better position to do the research and development to continually force the technology to improve on some of these common everyday discharges.

One of the reasons ambient standards are necessary in Florida is we are not trying to prohibit discharges into all of our ground water. In fact, we encourage recharge of aquifers through release

of sewage effluents and other kinds of releases that are treated. Somebody mentioned you can't separate water quantity and water quality. We don't in Florida. We have our regulations in the same agency.

So you need to know when people are safely discharging if you want to encourage that.

Finally, you obviously need ambient standards after the fact. They are the best tool for enforcement we have. If the ground water standards are violated, it is a very easy thing to go out and measure it and use it in enforcement. They have been our best enforcement tools.

One final thing. On the Federal role, I think the most important standard setting the Federal Government can do is to establish drinking water standards, not necessarily ground water standards, because our major concern as regulators is to be able to tell people when their drinking water supply is safe and when it isn't.

If the Federal Government will adopt what safe drinking water is, I think the States individually can turn around and decide what they need to do in the ground water to be sure that people have safe drinking water.

Mr. MOORE. I would agree with the last statement. I think that the most important standard that the Federal Government can set is to provide safe drinking water standards for a variety of substances and pesticides and set additional standards for pesticide applications and use of pesticides in addition to the drinking water standards. I think those two areas are of critical need throughout the country.

I have mixed feelings on what ambient standards can or can't do. Obviously our program tries to prohibit noncompatible uses of the ground water. So I wouldn't have a big need for ambient standards in much of our State because we try to prohibit those practices and technical standards for like underground storage tanks would be more appropriate.

In areas we are saying ground water discharges could occur from hazardous or toxic or landfills or things like that, then I think a mix of ambient and technical standards is probably the only way we can go.

Senator MITCHELL. The next question overlaps somewhat with the previous one but follows on it, so I will ask it. It is on source control guidelines and requirements.

What specific sources of contamination would you like to have standards or guidelines on? Should source controls be established on the basis of technology or performance standards, or should the emphasis be placed on land use controls?

Ms. FORT. I think in listening to the other States I am becoming aware that our answer to the last question is probably dictated by the fact we have so much less industrial development within the State of New Mexico, in both mining activities, dairy activities, other activities which are just probably not the focus of other States' regulatory efforts the way they are in our State. So we are looking at places, I think, where the source regulations would be helpful.

I wouldn't disagree with people who have said that RCRA, for example, in addressing leaking underground storage tanks is going to

be of wonderful assistance to the States in giving us national guidance. It is going to make it a much easier program for local dischargers, or local tankers who might become dischargers inadvertently, to follow.

That has been a helpful program to the State, in addition to the use of our own ambient standards.

Mr. DEAN. In the TVA area, several sources of contamination could be minimized with the proper legislation in very short order. For instance, we have scattered throughout the TVA area a lot of orphan coal mines that were mined out years ago and there are no funds currently to restore the mines to proper environmental stability. These mines leak acid and other obnoxious things into the ground water. In cooperation with the States progress toward surface cleanup is being made, but we haven't gotten the money to do anything directly about ground water contamination yet, at least to any great extent.

In the eastern part of our area, we found that industrial dumps, or toxic dumps of one kind or another, are obviously very dangerous and they need to be carefully regulated.

Then the petroleum, people that are drilling for oil, particularly in Kentucky and parts of Tennessee, have drilled into brine and this brine is working its way into the drinking water. So there should be some ground water controls over that operation, beyond what we have now.

Those are three that come to mind just off the top of my head.

Ms. TSCHINKEL. The type of source controls that might be needed, I think most of them lend themselves more to performance standards than to design, thinking of mining, percolation ponds, various types of metal plating, and other kinds of operations that might not be classified as hazardous wastes.

I think it would be very hard to design technology based standards that are design-oriented for things other than things that are extremely common and repeated often. Some of these things that discharge into ground water are rather land use and site specific. So I think we may wind up with performance standards for many of them.

Mr. MOORE. One of the things we are trying to do is to establish performance standards for small commercial establishments which slip out of the regulation in most of the other programs, things like drycleaners and laundromats and gas stations and things which don't fit in the regulatory picture from the State program side because they are so little and so small, and yet they have caused most of our contamination problem.

What we are trying to do is establish standards that the local governments can enforce. These say how these facilities should operate. So I think the performance standards on small sources are valuable. I think it needs to come out of the Federal Government, if at all, in the guidelines form rather than a regulatory form.

I think the source standards for major facilities like hazardous waste and other RCRA related facilities exist to a degree. They need to be looked at for ground water protection a little more closely, but I think the new RCRA amendments tend to do that as well.

Senator MITCHELL. What is the most important thing the Federal Government can do to support State ground water programs?

Ms. FORT. The answer is so trite it is going to sound silly. Provide money to State governments I think is one of the most important. Our program is not adequately funded for what we are realizing are the magnitude of tasks ahead of us.

I had earlier presented a report on leaking underground storage tanks and other petroleum contamination where I now have two people, one of whom basically takes phone calls on suspected contamination and the other goes out in the field. We are getting to these sites at such a slow rate that I think they are probably created more quickly than we are able to keep up with them.

Additionally, to be less glib about it, we would like to characterize the State's aquifers, and that would take money to do an adequate job of that.

And most importantly, in conjunction with other States in the standard setting process, the continued expertise available at a national level to use in either safe drinking water standards or other forms of design standards is very helpful for the States, as is national information systems which we are able to tie into it now.

Mr. DEAN. The Federal Government, of course, is in a position to, in addition to the areas Ms. Fort mentioned, offer a considerable amount of technical support. In fact, as an arm of the Federal Government, the TVA does not actually regulate water supply and other similer resources but we offer technical assistance to those who do.

We would be delighted, if we had the funds, to expand our role in the area we serve, which involves about 7 million people, and expand our research and technical support to the governing authorities.

Ms. TSCHINKEL. MCL's in drinking water, Mr. Chairman. We need those levels set by the Federal Government, and we need them fast.

Mr. MOORE. It is again drinking water standards and MCL's, in addition to a pesticides program that deals with impact and effect. I think the thing the Federal Government can do best in-house, and not assisting the States, but in-house, is to broaden the role of USGS in mapping and developing the ground water flows throughout this country.

Senator MITCHELL. What you have answered indicates the response to the next question, which is that a recent study by the Office of Technology Assessment reported that about half the States cite a need for the Federal Government to develop sound scientific information on the many contaminants found in ground water. That data would be used for development of State ground water standards. Would that be important to your State?

Ms. FORT. Mr. Chairman, yes, it would be very important. We use those numbers very directly in our regulation adoption process. That kind of technical expertise is something that makes the regulation development process go smoothly rather than consuming an inordinate amount of our already constrained resources.

Mr. DEAN. We certainly have spent a lot of our efforts up to this point trying to generate good information on what is really going on down there, and we can only support the premise that you have to have good information before you can proceed to attack the problem.

Ms. TSCHINKEL. To put it in perspective, you have hundreds of people in the States developing standards and duplicating each other. Those people could be out there in the field taking appropriate action against polluters if the standards could be adopted federally.

Mr. MOORE. I agree with that.

Senator MITCHELL. There are several Federal agencies involved in ground water related activities, including, among others, the EPA, the Geological Survey, the Department of Energy, and Department of Agriculture. In your experience, is coordination among these Federal agencies adequate?

Ms. FORT. No, Mr. Chairman. I think that there is not a national ground water policy. There are various statutes which touch on different aspects of ground water problems which are encountered by the State. We just had an experience with the Bureau of Land Management which was unhappy to learn that it owned a lagoon which had been used for produced water, storage of produced water, with a resulting contamination of a subdivision nearby and the production of hydrogen sulfide gas off the produced waters when some acid was dumped in. So the BLM is going to become an expert in ground water protection, perhaps, as a result of being a potentially responsible party in a Superfund action.

There is not that type of expertise spread out in the level of agencies with which we deal. We are obviously not dealing with the Washington part. There is not that type of expertise in the Federal Government's role as a major landowner. Almost 40 percent of all the land in the State is owned by one form of the Federal Government or another, in addition to lands owned by Indian tribes and other entities.

We, of course, are a major producer of hazardous waste in our State having the national laboratories within the State. So we deal with those entities both as regulated entities and standard setting entities and don't see at this point a lot of expertise within the agencies about their environmental responsibilities and ground water protection responsibilities. So they are working to develop it.

Mr. DEAN. As mentioned in our testimony, we found that there are some 60 agencies that have varying interests in the ground water problem, ranging from county health departments all the way to the EPA. We do not think there is sufficient coordination. We think that one of the fine things that could result from the hearings that your committee is holding is that it would improve this coordination.

Ms. TSCHINKEL. We have already talked about the Federal problem as polluters. I just want to mention the USGS has been extremely helpful to our State in gathering information and sampling on very good cooperative programs. So on the research side they have been very helpful.

On the regulatory side, I think EPA has tried to be as supportive as possible of Florida's program. Whereas they are not as active in the area as they might be, I think we have enough going so that we are handling the problem pretty well.

Probably if you want to talk about fragmented agencies I think we would have to look internally in the State for worse problems than the Federal Government in this area at the moment.

Mr. MOORE. Having worked with EPA, with a lot of the development of strategy and implementation, I know the cooperation between the two agencies, EPA and USGS, is improving. I think it has a ways to go, but I think those are the two primary agencies I see involved, and I think their roles need to be strengthened as they work together.

Senator MITCHELL. Some professionals in the field of water resources have suggested that effective protection of ground water quality requires coordination with programs related to ground water quantity. Coordination of ground water quality and quantity programs at the Federal level has been limited.

I have two questions. How has your State or area addressed the need to coordinate programs related to ground water quality and ground water quantity? Second, do you see a need for improvement in the coordination of Federal programs related to those two areas?

Ms. FORT. We addressed it. They are certainly very tightly linked. We try to address them through having the regulatory agency, the Water Control Commission, include the State engineer who is responsible for ground water quantity on that commission. He plays a very active role in the decisions of the commission. Incidentally, he is the one who has been quite concerned about the no degradation provisions because he doesn't want to see that interfere with his regulations concerning water quantity.

So we work together pretty closely in water issues. We have our conflicts since I am a representative of the Water Quality Agency. We have a lot of areas where we explore the differences between quantity and quality considerations.

I haven't seen that much evidence at a Federal level of areas where the relationship between the two is being recognized as it relates to ground water. I assume that is because the States have primary responsibility for both quantity and quality at this time. We just haven't seen much Federal management of water quantity.

Mr. DEAN. We see very little coordination in the seven-State area we serve among the agencies responsible for water quality and quantity. People tend to be concerned with the thing that is nearest and dearest to them at a given time.

For instance, in northern Mississippi, in the Tupelo area, they worry about the quantity of water. Ground water tables are down to the point where citizens are concerned about whether or not they are going to have enough water. In the eastern part of the Tennessee Valley where there is coal mining they don't seem to worry nearly as much about quantity as they do about quality. Certainly there has been no coordinated approach to the problems.

Ms. TSCHINKEL. The Florida legislature linked water quality and quantity in 1975 under our agency, but most of the water quantity day-to-day work is done by independent water management districts, but they are not statutorily independent. The water management districts are conducting a good part of our program in water quality, ground water related quality, management, and sampling.

We had an interesting conflict between the two a few months ago on a land use question. A new industrial park, a very modern one, was going to be sited at the edge of a new well field in south Florida. It became clear that the local government was counting on the well field for a large new consumptive use permit that would have

sucked in a lot of water from the sides. Yet they zoned this area for the industrial park. So the water management district made it clear that the local government was not going to be able to get the consumptive use permit it had hoped for because of the danger of bringing in pollutants from the outside.

So I think it is important. I have not seen any quantity-quality conflicts, at least in Florida, on the Federal level that need to be rectified.

Mr. MOORE. In Connecticut, as we developed our management program, we felt that we had absolutely no control over quantity in the northeastern State. The quality issues were never brought under civil law. We addressed that by putting in a bill which would allow us to regulate and to permit the diversion of water. It allows us to regulate any permit use over 50,000 gallons per day and register all existing uses. The intent there was to link the quality and quantity issues together, especially in terms of ground water, where induced infiltration from a source and the use of waters that were otherwise contaminated we could control and could prevent their uses from becoming future water quality problems.

So I think they need to be linked. I think it is a difficult challenge to do that on a Federal basis with the variety of Federal and State law on that.

Senator MITCHELL. I thank you all very much for your testimony. I apologize to Miss Fort and Mr. Dean for not having been present during your statements. I had to attend another committee meeting. But this has been a very useful and informative hearing for all of us, and I thank you again.

I will now adjourn the hearing.

[Whereupon, at 12:17 p.m., the subcommittee was recessed, to reconvene subject to the call of the Chair.]

[Statements submitted for the record follow:]

U.S. Senate Subcommittee on Toxic Substances and Environmental Oversight

Testimony of Denise Fort, Director
New Mexico Environmental Improvement Division at:
Hearing on Ground Water Contamination
June 20, 1985

HISTORY AND NATURE OF NEW MEXICO'S PROGRAM TO PROTECT GROUND WATER QUALITY

In New Mexico, much of which is arid water has historically been recognized as a resource which is limited, critical and basic to the well-being of the State. New Mexico law provides that the surface and underground waters of the State belong to the public and are subject to appropriation for beneficial use. The doctrine that priority of appropriation shall give the better right was followed by custom and court declaration in New Mexico for many years before it was enunciated in the State Constitution in 1911 and in surface water codes and ground water statutes in the first third of this century. The State Engineer has the authority to administer water rights permits.

This early concern about the quantity of water and the right to appropriate and use it has been followed in recent decades by concern over water quality. The Water Quality Act, adopted by the New Mexico State Legislature in 1967, addressed water pollution more specifically than earlier public health and public nuisance statutes. It defined the water to be protected as including all water within the state, whether surface or subsurface. The Water Quality Act established the Water Quality Control Commission (WQCC) and authorized it to adopt standards and regulations to prevent and abate water pollution from all types of activities, with the exception of oil and gas exploration and production which were already subject to regulation under the Oil and Gas Act. The Commission consists of the executive officers of eight agencies of state government whose mandate touches on water management or protection.

In the early 1970's it became apparent that a specific regulatory program to protect ground water quality should be developed under the authority of the Water Quality Act. The need for such specific regulation was clearly illustrated when a serious point source ground water pollution problem was discovered in the southeastern part of the state. The State of New Mexico brought suit against the discharger and won on the basis of public nuisance, but the case demonstrated that public nuisance was a difficult and unwieldy legal means of addressing ground water pollution problems and did not prevent those problems from arising. Prevention of ground water pollution is particularly important in New Mexico where 90% of the water used in public water supply systems comes from ground water sources, and where, in many areas of the state, the only source of water is ground water.

The statewide regulatory program established in New Mexico in response to ground water pollution has two principal facets: the setting of ground water quality standards, and the application of these to a discharger by means of a permit called a discharge plan. Regulations further require that a discharger demonstrate he will not cause those standards to be violated in the ground water. The regulations apply to well injection, seepage from surface impoundments or leach fields, land application of wastes, and any other discharges of effluent or leachate which may impact ground water, except those specifically exempted. A number of activities are regulated which may not appear to this committee to pose a threat to ground water; yet dairies with their manure lagoons and domestic septic tanks that are too closely spaced can cause a rise in nitrates in local ground water which in turn can cause methemoglobinemia or "blue baby syndrome" in infants - to cite only one example.

Development of the standards and regulations began in 1974; they were adopted by the Water Quality Control Commission in 1977 after extensive public hearings, and have been upheld by the New Mexico Supreme Court. They have been amended from time to time since 1977 to close gaps and cope with newly identified problems: in fact, amendments are proposed for public hearing later this year. Regulation development is a continuing process.

The agencies responsible for applying the regulations on a day-to-day basis are the New Mexico Environmental Improvement Division (EID) and the Oil Conservation Division (OCD). The OCD applies the WQCC regulations and the Oil and Gas Act

rules, as appropriate, to all facilities involved in the production, storage and refining of oil and natural gas or the production of geothermal energy. All other types of activities are regulated by the EID.

Basic regulatory policies and stategies which were incorporated into the regulations by the N.M. Water Quality Control Commission when they adopted the regulatory framework in 1977 include the following:

1. All ground water with a total dissolved solids (TDS) concentration of 10,000 mg/l or less is considered potentially usable and is protected under the regulations;
2. Limited degradation of ground water up to the ground water standards is allowed. If existing concentrations already exceed the standards, then no degradation beyond the existing concentration is allowed;
3. The regulations impose a performance standard, requiring that ground water standards must not be violated and toxic pollutants, as defined in the regulations, must not be present in quantities that pose a hazard to human health. The strategy of requiring a performance standard was chosen over the approach of imposing specific design, construction and operation requirements. The discharger has considerable flexibility in designing a system to meet the performance standard;
4. The burden of proof is on the discharger to demonstrate that the discharge will not cause standards to be violated.

In addition, New Mexico has Final Authorization for EPA's RCRA program and has incorporated RCRA's ground water protection standards as they apply to hazardous waste management facilities.

EXPERIENCE WITH THE NEW MEXICO PROGRAM TO DATE

Based on over eight years experience in administering the Water Quality Control Commission regulations to protect ground water quality, the following general observations can be made:

1. Effectiveness in preventing pollution

   The record shows that these regulations have proven to be extremely effective in preventing ground water pollution from new or newly modified discharges

initiated since the 1977 adoption of the regulations. Prevention of pollution has been found to be both technically and economically feasible. There have been several highly controversial discharge plans proposed, and in each case the position of the regulating agency, that approval could not be granted until the discharger demonstrated that standards would not be violated, has prevailed. There have been cases where some part of the discharge plan failed (e.g. a pond liner started to leak), but the monitoring system required under the plan detected the failure in time for corrective action to be taken to prevent large-scale ground water contamination. The only known cases of significant ground water contamination caused by discharges originating after 1977 have been a few isolated cases when a discharger started operation without informing the regulating agency and without obtaining an approved discharge plan, and thus was in violation of the law and the regulations.

At the same time, it must be noted that effective application of the regulations depends to a large degree on the political will and adequate staff and financial resources to address ground water pollution regardless of the source. In New Mexico, there is an important economic sector to which, in the past, regulatory restraints have not been applied as stringently as might be desired: the oil and gas industry. A new and more environmentally-oriented Energy and Minerals Department, at Governor Anaya's direction, is now addressing considerable effort to ground water protection at oil and gas facilities. In addition, irrigated agriculture is specifically exempted from the regulations (unless the irrigation water is received directly from any sewerage system). A third area that surfaced recently as an unaddressed potential source of ground water contamination is that of landfills used for disposal of liquid wastes, some of them hazardous. These facilities seem to fall on the fringes of half-a-dozen regulatory jurisdictions, with each agency preferring to imagine that another was handling the problem. It is this area in which a federal-state partnership can be fruitful: the identification of all potential sources of ground water contamination, and the insistence that all polluters be dealt with even-handedly. I will return to this point.

2. Effectiveness in correcting pre-1977 pollution.

Improving pollution controls at facilities operating before the 1977 implementation of the regulations and correcting and cleaning up past

pollution problems have proved to be extremely difficult and progress has been slower than desired. Once ground water pollution has occurred it is very expensive to clean up, even if it is technically feasible. It is administratively difficult to force dischargers to clean up, and each case demands a large amount of agency staff time. The EID is currently working on strengthening the regulations requiring remedial actions for existing contamination problems: those for which the source was discontinued before the effective date of the WQCC regulations, and those for which the source predated the WQCC regulations and remains active. Any regulatory scheme that, in essence, "grandfathers in" existing discharges leaves the potential for serious environmental damage; yet, as a practical matter, regulation of existing discharges is far more difficult to achieve than that of new discharges. Prevention is definitely preferable to belated attempts at a cure.

Prevention of contamination is even more important in ground water than it is in other environmental media such as surface water or air, because of the great technical difficulty and expense of cleaning up ground water. Therefore, it is vital to devote adequate regulatory staff effort to prevention now to avoid the need for much more effort and expenditure to correct problems later.

3. Numerical Standards as Compared to Narrative Standards

New Mexico's use of numerical standards has proven effective at preventing ground water pollution. Since it is not feasible to forbid the emission of all industrial and municipal effluent, some limited degradation of ground water is allowed in the New Mexico system under State law. However, ground water quality may not be degraded to the point that a ground water standard is exceeded. The standards, many of which are identical to federal drinking water standards, reflect concentration limits which protect human health if the water is drunk over the long or short term, and also protect the water for other domestic uses and for use as an irrigation supply. The regulations clearly define what is allowed, both for the discharger who is preparing a discharge plan and for the governmental regulator who is reviewing a proposal or bringing an enforcement action.

However, there is a drawback to numerical standards in that they cannot be established for all possible contaminants. The New Mexico ground water

quality standards, as originally adopted in 1977, contained 27 parameters then known to be of concern in the state. Almost all of them were inorganic chemicals. Groundwater contamination problems with organic chemicals were later discovered and hence the WQCC, after public hearing, adopted numerical standards for eight toxic organic chemicals. Numerical standards for other problem chemicals will be proposed in 1985, but the process of taking each parameter to hearing and adopting it into the regulations requires substantial commitment of time and resources. It is important to have a general "toxic pollutant" provision, which states that no listed toxic pollutant can be present in harmful concentrations. The WQCC regulations contain such a provision.

4. Numerical Standards as Compared to Design and Operation Requirements

Having water quality standards which are applied to ground water, rather than detailed design, construction and operation requirements, allows both the discharger and the government regulator to take site-specific conditions into account. This has turned out to be an important advantage in New Mexico where hydrologic, geologic and weather conditions vary greatly from one area to another. It has encouraged selection of good sites with natural barriers to ground-water contamination. However, the disadvantage is that site-specific evaluations require substantial commitments of staff with appropriate expertise. (It should be noted that siting, construction and operation requirements had to be adopted for certain classes of injection wells, in order that New Mexico be eligible for primary enforcement authority over the UIC program.)

5. Coordination with other governmental entities

As explained above, the regulatory program under discussion applies to all types of discharges except those specifically exempted. Two such exempted types of discharge are those from oil and gas production, which are controlled by regulations administered by the Oil Conservation Division (OCD), and coal mining which is controlled by regulations administered by the Coal Surface Mining Bureau (CSMB). Effort is required to coordinate EID efforts with those of OCD and CSMB, as well as to coordinate with the New Mexico State Engineer whose office administers water rights. Other intergovernmental contacts include those with other states. When efforts to develop the New

Mexico program were initiated in 1974, other states were contacted for information, but not much was available on ground-water regulation at that time. Since New Mexico's program was established, there has been considerable exchange with states looking for regulatory guidance for their own programs. These intergovernmental contacts are always informative.

THE STATE'S PERSPECTIVE ON FEDERAL AND STATE ROLE

The states and the federal government have a shared responsibility for protection of ground water quality. The states should have the authority largely to determine what measures are needed to protect ground water within their borders, for two reasons. First, the occurrence and characteristics of ground water depend very strongly on site-specific environmental factors such as geology, hydrology, topography, and precipitation. Second, the profile of principal contamination sources varies widely for each state, depending on its economic base, geohydrology and land use. Thus it would be virtually impossible to have detailed national requirements for a regulatory system that would be suitable to the widely differing conditions of the fifty states. For instance, a federal requirement or criterion which may be appropriate for states with high rainfall, could be completely inappropriate in the arid southwest. A pond liner which is adequate for one site might be completely inadequate at another site with more permeable underlying soils and a more transmissive aquifer containing high quality ground water. This same liner might be unnecessarily expensive for a third site where depth to highly mineralized ground water is several hundred feet and the intervening formations are virtually impermeable.

Each state should take the responsibility of determining what is appropriate for its particular conditions. In New Mexico, some of the factors that may be considered in the decision whether or not to permit a particular facility include the following: the installation of pond liners (either synthetic or of natural materials such as compacted clay) demonstrated to be adequate for the type of effluent under consideration; casing, cementing and geologic details to demonstrate adequacy of injection wells; crop uptake of nitrogenous contaminants in effluents such as domestic sewage and dairy wastes, when applied to the land; treatment of the effluent before discharge onto or below the ground; naturally occuring

characteristics of the earth materials underlying the site (e.g., confining beds between the discharge and the aquifer, or cation exchange properties of the soils); dilution in the aquifer; weather conditions at the site (for the total evaporation ponds commonly used in the uranium and power industries to be effective, annual evaporation must far exceed annual precipitation); or any other factor that the discharger can demonstrate is relevant to the protection of ground water from his effluent at his site.

At the same time, in order to assure that ground water is adequately protected nation-wide, there should be (1) federal support to strengthen state programs, (2) minimum federal standards (leaving each state the option of enacting more stringent standards), and (3) an oversight role on the part of the federal government such that if any state is not performing satisfactorily, the federal government can step in to protect natural resources, human health or property. Without such a partnership, some Americans may find that their state has become a "pollution haven" because their state officials have chosen to let economic considerations outweigh environmental protection. The cost of cleaning up the inevitable contaminated ground water in such states must be borne by the citizens of the entire nation, thus saddling the citizens of environmentally conscious states with the burden first of paying to prevent ground water pollution in their own state and then of paying to clean up ground water in states which practice less foresight.

However, while recognizing the importance of the federal role in ground water quality protection, we can not overstress that federal authorities must be flexible in judging whether a state program is "equivalent" to the federal minimum. Equivalency should be judged by the results in protecting ground water, not by whether the details of the state's program are identical with federal guidelines which may or may not be suitable to that state's climate and geology. In our experience, EPA's approach to evaluating state-delegated programs is to compare them to detailed specifications and to balk at any minor deviations. States have complained of this paper-pushing approach since the inception of federal environmental laws; any impetus that Congress can give to de-emphasizing paper requirements would help.

Since prevention of ground water pollution is so much more technically feasible and cost-effective than clean-up after pollution has occurred, an adequate share of both

federal and state resources should go to prevention efforts. Allowing too many resources to be diverted to clean-up efforts so that prevention is neglected would lead to much more serious problems in the future.

There are certain aspects of ground water protection where the federal government's efforts are extremely beneficial to the state. These include:

1. Providing basic medical information and other technical expertise. In particular, the valuable series on "Ambient Water Quality Criteria" should be expanded and updated. We also suggest expansion of research on cocarcinogenicity, comutagenicity and synergism of organic chemicals that could be found as water pollutants. Present EPA research on ground-water microbiology is also highly relevant to our work; and
2. Support for data management and analysis. These are a crucial part of any ground water quality strategy. The present U.S. Geological Survey and EPA programs such as WATSTORE, STORET and NAWDEX should be expanded and support provided to enable states to make fuller use of them. Use of EPA computers and government programs for modeling contaminant transport, with training programs, help staff to evaluate ground water management and remedial action alternatives. Funding for microcomputers would make models more accessible.

There are several aspects of New Mexico's ground water protection program which could be improved, and federal support could make possible or could expedite those improvements. Those areas include:

1. Study of selected prioritized areas to determine if aquifers in those areas are especially vulnerable to particular waste disposal activities;
2. Improvement of regulations pertaining to remedial actions;
3. Improvement of coordination between the well-established state ground water protection program and the newer federal program elements such as the Underground Storage Tanks program and other 1984 RCRA amendments;
4. Study of selected types of facilities, such as landfills, to determine whether regulatory improvements are needed to prevent ground water contamination; and
5. Support to the state to help further improve monitoring and laboratory analysis capabilities.

In conclusion, ground water quality protection is an area in which both the states and the federal government must cooperate. Because the occurrence and characteristics of ground water are so dependent on site-specific factors, states must have the primary role in developing programs appropriate for their specific conditions. The federal government should establish minimum ground water standards and should stand ready to enforce them in cases where the states have not taken action; however, the federal authorities must be flexible in judging "equivalency" of state programs with federal guidelines. The federal government should maintain and expand its role in providing medical information and other technical expertise and data management capabilities, and support and oversee the states in development and implementation of effective ground water protection programs.

STATEMENT OF CHARLES H. DEAN, JR.
CHAIRMAN OF THE BOARD
TENNESSEE VALLEY AUTHORITY (TVA)
BEFORE THE SUBCOMMITTEE ON TOXIC SUBSTANCES
AND ENVIRONMENTAL OVERSIGHT
UNITED STATES SENATE
JUNE 20, 1985

It is a pleasure for me to testify before the Subcommittee on Toxic Substances and Environmental Oversight on TVA's interest in and experience with groundwater. As a resource management and development agency, TVA periodically looks at portions of the Tennessee Valley's natural wealth to see how it is being affected. Based on these reviews, TVA works with the Valley States, appropriate Federal agencies, and local communities to develop recommendations on how to enhance and protect a resource or restore one that is damaged. TVA, of course, generally has no obligation or authority to implement many of the recommendations; consequently its focus is on helping others to reach decisions. A good example of this type of initiative is a June 1984 TVA staff report entitled "Groundwater Situation Assessment of the Tennessee Valley." TVA undertook this study because of the number of groundwater contamination incidents that have been reported in the TVA region over the past few years, public interest in groundwater quality, and the overall need to evaluate groundwater quantity, quality, and use.

Groundwater Use

In its assessment, TVA found a surprising dependence on groundwater for drinking water and incidents of unaddressed pollution that were both

startling and unexpected. Although with an average annual rainfall of 52 inches the Tennessee Valley is blessed with an abundance of water, it is becoming increasingly dependent on groundwater for such primary purposes as public supplies, rural use, and self-supplied industrial use. To illustrate:

- Over 64 percent of the region's residents rely totally or in part on groundwater for their potable water supplies: 22 percent self-supplied, 31 percent on groundwater-supplied public systems, and 11 percent on combined surface and groundwater-supplied public water systems.

- Over 1.7 million residents in the region maintain an individual household groundwater system, usually a well.

- Groundwater is used by nearly 3,700 community water systems, businesses, industries, hospitals, churches, campgrounds, and schools.

- Estimates of groundwater withdrawals for the Tennessee River drainage area for the period of 1970 to 1980 indicate that groundwater withdrawals have increased by 51 percent from 173 to 262 million gallons per day. More importantly, this trend is not expected to change in the foreseeable furture.

Groundwater Contamination

TVA's survey of groundwater conditions and information obtained since 1983 found that there are serious instances of groundwater contamination in the Tennessee Valley. The sources of documented groundwater contamination include pollutants from wastewater impoundments, improper solid waste disposal, coal mining activities, oil and gas exploration, agricultural activities, improperly installed and failing septic tanks, and general urbanization activities. An indication of the seriousness of groundwater contamination is the nearly 2,400 cases of acute groundwater-borne disease in the seven Valley States from bacterial sources in the last five years, which includes 246 cases of hepatitis with one fatality.

One of the most striking examples of severe groundwater contamination is the Bowling Green-Warren County area of Kentucky. Regulatory officials from the Commonwealth of Kentucky noted in their 305(b) water quality report to Congress that leaking underground gasoline storage tanks and explosions had forced area residents to evacuate their homes because of the buildup of gas fumes in their basements. Kentucky officials also believe that industrial wastes are contaminating groundwater, because detectable concentrations of total cyanide, lead, cadmium, chromium, copper, iron, nickel, zinc, and arsenic (up to 0.10 milligrams per liter) have been found in local groundwater samples. Volatile organics that are known carcinogens were also detected in concentrations that exceeded what

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EPA has in other contexts considered to be de minimus. The State has attributed these problems to leaking industrial pits, spills, industrial discharges to sinkholes, and offsite waste haulers. Although the Center for Disease Control has issued a public health advisory and investigations under "Superfund" have been initiated, cleanup is expected to be expensive and the potential for public health and safety problems will remain until groundwaters and their recharge areas are cleaned up.

In the coal mining areas of Appalachia, portions of major aquifers have become degraded in quality to the point that they cannot be used for drinking water, primarily because of high levels of iron, dissolved solids, and acidity. This degradation is particularly severe in area mining of shaly, pyritic coal. A recent survey conducted by the University of Kentucky of 197 water supply wells in one county in eastern Kentucky found that 44 wells began experiencing water quality or quantity problems within several years following the start of mining in 1980. Similar problems have been reported by citizens in Tennessee who noted that their well water turned red or orange from iron, tasted bad, or eventually went dry even though they were several miles from the mine site. The solution to these problems may involve installing distillation or filtering systems, drilling new wells, or moving to another location. Polluted groundwater has also degraded surface waters, especially in the case of acid mine drainage. In Walker County, Alabama, acid groundwater has been reported to depress surface water pH to 2.9, which subsequently damaged concrete and metal culverts. TVA thinks that further investigations are needed to document the extent of groundwater contamination occurring in the coalfields.

Oil and gas exploration and production activities are also causing significant damage to groundwater. Kentucky reports 700 contaminated wells in one county, with 200 wells rendered unusable because of brine wastes from the 1980-83 oil boom. Although Kentucky declared a state of emergency, the problem remains unsolved. In fact sodium alerts are periodically declared for public water supplies, with over 60 percent of the State's supplies exceeding the standard for sodium-restricted diets.

In addition to these adverse conditions a survey of local health officials indicates that in counties with selfsupplied wells fecal coliform contamination often occurs, possibly due to improper sewage disposal or improper facility construction. Local health officials estimate that 50 to 70 percent of the wells in some counties may be contaminated with coliform bacteria that are usually associated with human wastes. In one particular instance, approximately 30 percent of the 30,000 homes in a 4-county area of western North Carolina had drinking water samples contaminated with bacteria.

Data and Institutional Issues

One of the major findings of TVA's groundwater assessment was the involvement, to some degree, with groundwater of over 60 Federal and State agencies in the TVA region. This was not surprising since there are at least 16 Federal statutes that contain groundwater protection provisions. We found that most agencies began their groundwater programs in the mid-1970s when waste disposal legislation was passed. Discussions with these agencies disclosed that there is little coordination or even communication among many of them; consequently there are inefficiencies,

overlaps, fragmentation of responsibilities, duplication of effort, and a disproportionate emphasis on emergency response to contamination at the expense of upfront resource protection.

TVA's survey also found that existing data on groundwater quality were primarily limited to inorganic nonmetals, metals, and bacteriological parameters. General assessments of regional groundwater quality for extended lists of parameters, such as the Environmental Protection Agency's (EPA) 129 priority pollutants, have not been routinely performed in the past and are not currently being undertaken. More significantly, there are no plans for comprehensive assessments in the immediate future. This lack of information is unfortunate, especially in light of the number of hazardous waste sites in the country and EPA's determination that 410 of the 547 sites on the Superfund National Priority List have been targeted for cleanup because of their potential adverse impact on groundwater.

Because of lack of data, the TVA survey did not evaluate the impacts of inactive hazardous waste sites on groundwater. EPA's experience with hazardous waste sites and associated groundwater contamination under Superfund, however, indicates that inactive waste sites may be contributing to groundwater contamination. For example, out of a total of 910 inactive waste sites, Tennessee has identified 248 sites at 98 locations under its Superfund program that it believes pose a potential threat to public health, safety, and the environment. North Carolina

has over 2,000 toxic waste sites. At the limited number of sites with groundwater data, contamination has been confirmed at 240 of the sites.

To summarize the results of our assessment and the information obtained since 1983, TVA found that there is a considerable amount of groundwater data in various Federal and State agencies' files. These data are difficult to access and are of questionable utility because of poor quality assurance. For example, wells are not geographically located and only limited measurements were taken. We also found that pump tests are conducted only to assure an adequate domestic supply, and quality measurements are limited to fecal coliform or physical constituents. With the limited funding available to the different agencies, it is not surprising that quality assurance of groundwater data is often poor, systematic data collection efforts are absent, data interpretation is limited, and many important water quality constituents are not analyzed. A cooperative State and Federal program for assessing the status of groundwater quality and using that information to mount effective protection programs is urgently needed.

TVA's Perspective on Groundwater

TVA supports EPA's Groundwater Protection Strategy and basic groundwater policies as an essential first step in addressing groundwater issues. However, EPA's Groundwater Protection Strategy acknowledges the inadequate nature of some State groundwater protection programs and the

inconsistencies that exist in EPA programs. It also tends to concentrate on after-the-fact actions to clean up contaminated groundwater rather than preventative protection of the resource. Thus many widespread sources of contamination are unaddressed. TVA believes a strong pollution prevention approach is an indispensable aspect of public health protection and the preservation of underground water supplies for future use. Pollution prevention is not only more cost effective, but reduces dependence on risk assessments and the uncertainty associated with long-term, low-level exposures to potentially toxic chemicals.

A voluntary, guideline approach for State participation in groundwater protection is also advocated in EPA's current strategy. Such a voluntary strategy will likely be inadequate to overcome the formidable institutional impediments that exist. Although some States will take the initiative and improve protection efforts, experience shows that others will be reluctant to undertake any new program except when public health is threatened or there is a major resource crisis. To resolve this issue we urge consideration of an environmental protection program that would be based, in part, on a stragegy of minimum national requirements that State programs must meet. This approach helps assure consistency between States while protecting public health and safety and the environment. It also effectively discourages the creation of "pollution havens". Review of the groundwater situation in the seven Valley States strongly suggests that this approach would be an effective way to assure adequate and consistent protection for groundwater.

TVA also advocates the unified management of surface and subsurface waters because of their interaction. We have found that during low flow conditions, subsurface waters make a substantial contribution to surface flows. This finding has also been substantiated by others in the scientific literature on acid mine drainage, irrigation return flows, and nonpoint sources of pollutants. In the Tennessee Valley, we have found that polluted runoff from urban and agricultural areas drains into sinkholes and contaminates groundwater; and polluted groundwater from inadequate or poorly functioning septic tank systems oftentimes flows to surface waters, contaminating them. Because of this interaction, it seems that management of both surface and subsurface water quality, possibly under the authority of the Clean Water Act, would help avoid fragmented responsibilities.

TVA's Groundwater Activities

Since the early 1970s, TVA has been monitoring groundwater quality at power plant waste disposal sites. Laboratory and field studies and mathematical models have been used to examine potential groundwater impacts from the storage of coal combustion wastes, as well as from coal and uranium mining activities.

TVA's groundwater activities have been expanded from monitoring groundwater quality near TVA facilities to including more comprehensive groundwater demonstrations. As a result of the 1984 groundwater assessment,

a cooperative project has been undertaken with the First Tennessee Development District in upper east Tennessee. This groundwater demonstration is a joint local, State, and Federal effort to develop and implement a groundwater protection plan for an 8-county region. The first task of the demonstration was the collection of groundwater quality data. The initial groundwater survey dealt with priority pollutants that are not routinely surveyed by the State. Other tasks include the use of remote sensing and geohydrologic expertise to better delineate the recharge areas for groundwater supplies. TVA will also map the limestone aquifer recharge areas and various natural structural controls such as sinkholes. Once the recharge areas are estimated, TVA will provide technical assistance to the development district to protect the recharge areas. Additional efforts will be tailored to the land-use activities in the recharge areas, such as proper sewage and waste management. TVA has also included an environmental education component in the project, which will be modified for public information and educational use for students and adults after the project is completed.

Summary

TVA published a report in June 1984 on the status of groundwater in the Tennessee Valley. The assessment made use of available data and interviews with staff from various State, local, and Federal agencies having responsibilities for groundwater. TVA's assessment found a greater dependence on groundwater than originally envisioned with 64 percent of the region's residents relying either totally or in part on groundwater for their potable water supplies. It also found serious incidents of

groundwater contamination from improper waste disposal, coal mining activities, oil and gas exploration, agricultural activities, septic tanks, and general urbanization activities. One of the major factors contributing to the overall groundwater dilemma in the Valley is the lack of coordination between the 60 Federal and State agencies involved with groundwater in the region. This and other institutional issues have resulted in an oftentimes fragmented approach in dealing with groundwater issues, duplication of effort, the collection of groundwater data of limited value, and programs that are oftentimes oriented toward crisis management rather than resource protection.

While the number and severity of documented groundwater contamination incidents are as yet undetermined, there is sufficient information to justify a comprehensive and better coordinated effort to protect groundwater. TVA believes that groundwater is a particularly vulnerable natural resource, and restoration is extremely difficult, expensive, and time consuming with current technology. Based on TVA's experience in the Tennessee Valley, we believe a first step would be the unified Federal/State management of both surface and subsurface water quality, possibly under the authority of the Clean Water Act. Adoption of such a unified approach would recognize the interdependence of surface and subsurface waters and would be a vehicle for State agencies to integrate groundwater protection provisions specified in other environmental statutes.

NONPOINT SOURCE POLLUTION FROM PLANT NUTRIENTS

O. P. Engelstad
Director, Division of Agricultural Development
Tennessee Valley Authority
Muscle Shoals, Alabama 35660

Of the essential nutrients for plant growth, nitrogen and phosphorus are of greatest concern as pollutants for reasons that will be discussed later. However, these two nutrients differ markedly in the way they act in the soil. Nitrogen is a mobile nutrient, while phosphorus is immobile. These nutrients are supplied in fertilizer to supplement soil supplies.

Soil nitrogen is released from organic forms. Decomposition of soil organic matter by microbial action will first produce ammonium. Ammonium ions are either adsorbed at the cation exchange sites of soil clay minerals or, with good aeration and proper temperatures conducive for the activity of nitrifying bacteria, are converted to nitrate. In the case of surface erosion, nitrogen is removed from cropland primarily as particulate organic matter or as ammonium attached to soil particles. However, once nitrate is in the soil solution, it is subject to leaching, and can ultimately enter the groundwater. Fertilizer nitrogen is subject to these same processes.

Phosphorus is another case. Any phosphorus which appears in the soil solution, either from fertilizer or from the decomposition

To be presented at "Perspectives on Nonpoint Source Pollution," in Kansas City, Missouri, May 19-22, 1985.

of organic matter, can become attached to soil clay minerals as a phosphate complex or be rapidly converted to an inorganic form of metal phosphate, the type depending on soil aeration and pH conditions. All of these inorganic forms of phosphates in the soil are relatively insoluble and result in low concentration in soil solution (generally < 0.2 mg/l). Hence, phosphorus losses to surface waters generally result through soil erosion.

It is generally felt that losses of phosphorus and inorganic nitrogen to surface waters can be reduced through the introduction and use of soil management practices that slow surface runoff. The question remains as to the losses of nitrate to groundwater due to its mobility.

Plant nutrients from either soil or fertilizer become potential pollutants when they are present in quantities that exceed plant requirements or the capacity of the soil to act as a "reservoir" for future use in plant uptake. The movement of plant nutrients is affected to a large degree by the soil type and climate as well as by agricultural practice. For example, where irrigation is practiced, salts as well as nitrates can become a groundwater problem. In the prairie regions, the residual fertility of these soils can add to a nitrates-groundwater problem even without the addition of fertilizer. To a certain degree, the potential for nonpoint source pollution from plant nutrients is a natural one, and the degree to which the addition of fertilizer components exacerbates this problem may well be a question to be answered in

the context of regional background levels based on soil type, climate, and quality of runoff, surface waters, and groundwater of areas under natural cover. This latter point serves to raise questions about uncertainties in forming comprehensive policy when the magnitude and variability of the water quality problem is illustrated by regional studies.

Magnitude of Pollution from Plant Nutrients

Studies from such different regions as the Chesapeake Bay, the Great Lakes, the cropland areas of Kentucky, and other parts of the South including the Coastal Plains soils, underscore the potential seriousness of the problem created by plant nutrients when they are displaced and become pollutants. The Chesapeake Bay and Lake Erie studies reveal that pollution by plant nutrients is caused by excessive runoff. The Lake Erie Wastewater Management Study (LEWMS) concentrated on phosphorus losses accompanying soil erosion from cropland. Phosphorus was emphasized in the study because that element is considered to be the limiting factor in eutrophication of Lake Erie, the objective being water quality improvement by control of phosphorus. In 1980, the LEWMS revealed that 8,400 MT/yr or 51 percent of the total Lake Erie phosphorus loading was due to runoff (nonpoint source) from rural land, principally cropland[1]. The Chesapeake Bay study indicated that nonpoint source runoff from cropland is currently responsible for the greatest amount of nutrient load to the Bay. It has been estimated that nonpoint

sources contribute 67 percent of the nitrogen and 39 percent of the phosphorus load to the Bay.[2]

In the South, the source of nitrates in groundwater has not been well identified nor have fluctuations in concentration been as sensational as in other parts of the country. A study of nitrogen contents in shallow groundwater in the North Carolina Coastal Plain indicates that nitrate concentrations in the upper part of the groundwater under fertilized cropland are greater than under adjacent wooded areas, and that nitrate levels are most likely to be higher under the better drained soils than under adjacent wetter sites.[3] With a greater incidence of high water tables and tighter soils, there may be a greater incidence of denitrification, especially with respect to Coastal Plain soils. However, separate studies in Georgia and North Carolina showed increases in nitrate concentrations in surface waters after stream channelization.[4 & 5] The increases were attributed to greater groundwater inputs due to the deeper channelization penetrating the shallow groundwater table.

Many studies of nitrate concentrations in stream waters are concerned with subsurface flow. Studies in Georgia and elsewhere show that most of the nitrate applied as nitrogen fertilizers is moved into the soil during the first few minutes of rainfall.[6] Some of it then reappears in surface waters from tile drainage and subsurface flow. It has been shown that subsurface flow of water in soils underlain by plinthite in the upland Georgia Coastal Plain is responsible for 99 percent of the total nitrate lost.[7] Studies of North Carolina

Coastal Plain soils show that nitrate enters surface streams via tile drainage flow.[8] This observation has also been made in the Lake Erie Basin where monitoring of storm events shows that the majority of the nitrate reaches surface water sampling stations during the falling portions of the hydrograph, in contrast to sediment and phosphorus. The contribution of this nitrate to drinking water can be significant, and has reached major proportions in the Sandusky River in northwestern Ohio. Nitrate exceeds the standard limit for drinking water about 4 percent of the time during the year, and the limit is exceeded about 16 percent of the time during May, June, and July.[9] While mineralization and nitrification of organic N are high during those months, it is also the time when fertilizer is being applied most frequently in that area. This has serious implications for the fertilizer industry, as total N losses via stream flow are considered to be equivalent to about 43 percent of the fertilizer N applied.[9] Of course, some of this loss could well have originated from organic sources.

Knowledge about the link between fertilizer nitrogen applied to soils and the nitrate concentration in drinking water also comes at a time when increased nitrogen application rates on agricultural lands are predicted. While a case can be made that fertilizer nitrate losses need to be weighed against potential improvements in nitrate utilization by the crop, the fact remains that nitrogen placed on croplands in a single application early in the season may be susceptible to loss to surface and groundwaters.

Control Practices

Some steps have been taken toward abating pollution caused by plant nutrients. The first two steps in abatement usually involve identifying and inventorying the extent of the problem and projecting reasonable goals (in terms of time, cost, percent reduction) to be attained. An example can be taken from those doing the Lake Erie Wastewater Management Study. For them, investigation of nonpoint sources of phosphorus loading led to identifying soil erosion from cropland as a major source of the problem. The second step was to make projections on reducing soil erosion. This was found to be dependent on the types of conservation practices instituted. To make the projections, a land resource information data base was developed which helped to calculate potential soil erosion in the Lake Erie Basin. The resulting conclusion: If reduced tillage were used in suitable areas, a reduction of 40 percent of the erosion potential would be achieved, and if both no-till and reduced tillage were employed, a reduction of 69 percent of the erosion potential in the Lake Erie Basin could be attained. The present goal is to reduce erosion by 48 percent, which will reduce phosphorus loading of Lake Erie by 32 percent over a 20-year period, with 90 percent of the reduction occurring in the first seven yea .[2]

Wi goals identified, erosion control usually is left to a set of methods known as Best Management Practices. BMP's allow for

tailoring a management system for a specific site and can depend on a number of factors ranging from environmental, land, and economic considerations to effectiveness of a certain practice. For example, in certain parts of the Lake Erie Basin where plant available phosphorus levels can be high, yearly soil tests are suggested to determine if phosphorus supplements are even needed during that growing season. In North Carolina and Virginia, buffer strips along waterways are employed for entrapment of phosphorus and associated sediment originating from field runoff, thus reducing nutrient loading and turbidity.

Best Management Practices which control phosphorus are linked to controlling erosion. However, there remains considerable question as to the control of nitrogen. Studies in North Carolina using buffer strips for sediment and phosphorus control have been expanded to include considerations in nitrate control, especially from tile drainage and natural subsurface flow. Because the woody shrubs and trees in this riparian ecosystem-buffer zone can remove nutrients from subsurface flow, attempts to study and manage the alluvial storage of nutrients in the riparian zone for uptake by riparian vegetation have been made. Careful management of these zones can prolong the usefulness of this riparian ecosystem as an energy source and as a nutrient filter.[10]

The no-till system has received increased interest as both an energy saving and erosion control measure in the South and East. A comparative study in Maryland of nutrient losses from two

watersheds, one in conventional corn production and the other in no-till corn, reports a nine-fold decrease in the amount of runoff with no-till corn; a twenty-fold decrease in total P runoff with no-till corn; and a corresponding ten-fold decrease in both NO_3-N and total nitrogen in runoff with no-till corn.[11] A similar decrease in nitrate runoff was seen in no-till soybeans on soils formed in loess in northern Mississippi.[12] However, studies of groundwater pollution from nitrate, particularly in the Midwest, give cause for concern about this nutrient moving into the groundwater, especially when soils are of medium texture and are well drained.

Uncertainties in Plant Nutrient Control

As can be judged from the weight of the preceding discussion, the nutrient of major interest is nitrate. Largely because of its high mobility, nitrate may be extremely difficult to manage. Studies concerning the mobility of nitrogen in the plant-soil environment underscore growing concerns about the role nitrate plays as a source of pollution. Despite concerns by other researchers that there may be a greater potential for leaching of nitrates to the groundwater with no-till, a study in Kentucky seems to indicate that the potential for nitrate loss to groundwater is more related to application rates rather than tillage practice.[13] Further, questions remain as to the percent N tied up in crop residues, microbial populations, and the percent of nitrogen applied the

previous year that could be recovered in the grain the following year.

Increased interest in residue management for no-till cultivation has also increased concerns of nitrogen leaching. Residue management in no-till requires the subsurface application of fertilizer and pesticides in the soil to reduce their loss from runoff without residue incorporation.[14]

A good case for using and managing the riparian zone parallel to the rivers of the Atlantic Coastal Plain for the control of nitrate in subsurface flow and the control of surface runoff of sediment and phosphorus has been made by researchers. But this buffer zone is itself an ecosystem, and is of value only if it is used and monitored wisely. It cannot be regarded as a "sink." The extent to which this nitrogen can be managed so that it remains in place until used by the riparian vegetation is a crucial question.

Also, predictions about increases in groundwater pollution based on projections of continued (and growing) high nitrogen rates, tillage practice, and other agricultural practices are subject to question based on current efforts to inhibit N losses by controlling nitrification rates. If rate of nitrification is controlled in such a way that nitrate is made available when needed by the plant, the nitrogen application rate may actually decrease in the future. The same concept holds for work to control losses of fertilizer nitrogen from volatilization. If volatilization is reduced, rate of nitrogen application can also be reduced, which may in term decrease projected losses to surface and groundwaters.

Needs for Future Research

A discussion of uncertainties necessitates deliberation of future research needs. The control of phosphorus losses through control of runoff and erosion is more certain than control of nitrogen losses. Future research must attempt to understand more completely the role of fertilizer nitrate as a nonpoint source pollutant.

Attempts to understand nitrate from a fertilizer point of view will involve studies in:

1. Use of combinations (ammoniacal, amide, nitrate) of N-fertilizers.
2. Use of urease and nitrification inhibitors.
3. Fertilizer application timing and placement system as it relates to crop requirement.
4. More thorough ^{15}N trace accounting of nitrate pathways and losses.
5. Assessment of natural background levels of nitrate in groundwater for different climatic and soil regions.
6. Assessment of Best Management Practices for controlling nitrates given the crop under production, and the management system.
7. Careful monitoring and use of the riparian ecosystem for the Eastern Coastal Plain.

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We know from studies mentioned above that nitrate can be a problem in some areas. Is it confined to these identified pockets or a more general problem? We need to know how serious and pervasive nitrate is as a nonpoint source pollutant in groundwater. Research should be enlarged to provide this sort of information.

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VICTORIA J. TSCHINKEL, SECRETARY
FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

TESTIMONY TO THE
U.S. SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
HEARINGS ON GROUNDWATER

JUNE 20, 1985
WASHINGTON, D.C.

FLORIDA'S GROUNDWATER PROGRAM

THREATS TO FLORIDA'S GROUNDWATER

FLORIDA'S GROUNDWATER PROTECTION PROGRAM IS AMONG THE STRONGEST IN THE NATION. WE ADOPTED GROUNDWATER PROTECTION RULES IN 1982 WHICH PLACED US IN THE FOREFRONT OF STATES' EFFORTS TO PROTECT GROUNDWATER. WE ALSO HAVE ADOPTED MAXIMUM CONTAMINANT LEVELS FOR EIGHT TOXIC ORGANIC CHEMICALS IN DRINKING WATER, AND ARE THE ONLY STATE WHICH REQUIRES TESTING FOR NEARLY 120 POTENTIAL CONTAMINANTS IN DRINKING WATER. ALSO, THE 1983 FLORIDA LEGISLATURE ADOPTED LANDMARK LEGISLATION WHICH ADDRESSES VIRTUALLY EVERY ASPECT OF GROUNDWATER MANAGEMENT AND PROTECTION.

BEFORE I DISCUSS THESE IN MORE DETAIL, LET ME OUTLINE SOME OF THE THREATS TO GROUNDWATER WE HAVE IN OUR STATE AND SOME OF THE INCIDENTS WHICH LED TO ADOPTION OF THESE LAWS AND REGULATIONS.

NINETY-TWO PERCENT OF FLORIDA RESIDENTS DEPEND ON GROUNDWATER FOR THEIR DRINKING WATER. OUR AQUIFERS, BECAUSE MOST LIE VERY CLOSE TO THE SURFACE AND ARE OVERLAIN BY POROUS SURFACES, ARE UNFORTUNATELY, VERY SUSCEPTIBLE TO CONTAMINATION.

FLORIDA IS NOT GENERALLY CONSIDERED AN INDUSTRIALIZED STATE, BUT IT HAS ITS SHARE OF GROUNDWATER POLLUTION SOURCES, WHICH INCLUDE:

--6,000 SURFACE IMPOUNDMENTS;

--9,000 DRAINAGE WELLS;

--40,000 UNDERGROUND STORAGE TANKS IN SERVICE STATIONS ALONE, AND OVER 60,000 STATEWIDE IN ALL LOCATIONS;

.--246 SITES IN THE STATE WITH CONFIRMED GROUNDWATER CONTAMINATION--HALF FROM PETROLEUM-RELATED INCIDENTS; AND

--THE STATE USES MORE PESTICIDES THAN ANY OTHER STATE IN THE NATION, EVEN THOUGH WE ARE JUST 33RD IN THE AMOUNT OF PLANTED ACREAGE.

GROUNDWATER RULE--(COPY ATTACHED) GROUNDWATER RULES WERE ADOPTED TO HELP REDUCE THESE THREATS.

THE RULE ESTABLISHES MINIMUM WATER QUALITY CRITERIA DESIGNED TO PREVENT THE INTRODUCTION OF DANGEROUS TOXIC AND CARCINOGENIC MATERIALS INTO WATER SUPPLIES, AND ALLOWS A RESTRICTIVE ZONE OF DISCHARGE FOR OTHER CONTAMINANTS.

THE RULE ALSO CLASSIFIES GROUNDWATER. IN ADDITION TO THE GENERAL CONTROL OF TOXIC MATERIALS, THE RULE APPLIES PRIMARY AND WILL APPLY SECONDARY DRINKING WATER STANDARDS. THE RULE ENCOURAGES RECYCLING OF WASTEWATERS WHICH ARE COMPATIBLE WITH RECEIVING GROUNDWATER.

BASED ON OUR EXPERIENCE WITH THE STATE GROUNDWATER RULE SO FAR, WE ARE MAKING SUBSTANTIAL REVISIONS TO THE "G-1" CATEGORY OF AQUIFERS, THE HIGHEST GROUNDWATER CLASSIFICATION WHICH IN TURN PROVIDES THE MOST PROTECTION.

IN GENERAL, AQUIFERS WOULD QUALIFY FOR POTENTIAL DESIGNATION IF THEY ARE CURRENT SOURCES OF PUBLIC DRINKING WATER SUPPLY, HIGH RECHARGE AREAS, SINGLE SOURCE AQUIFERS IN LIMITED AREAS AND AQUIFERS SET ASIDE FOR FUTURE PUBLIC WATER SUPPLY. THE LEVEL OF PROTECTION AFFORDED WOULD VARY WITHIN THESE CATEGORIES, WITH CURRENT PUBLIC WATER SUPPLIES RECEIVING THE HIGHEST PROTECTION.

THE WATER QUALITY ASSURANCE ACT OF 1983--(COPY ATTACHED) AT ABOUT THE SAME TIME OUR GROUNDWATER RULES WERE DEVELOPED, THE PESTICIDE ALDICARB WAS DISCOVERED IN GROUNDWATER AND SEVERAL DRINKING WATER WELLS IN FLORIDA. THE STATE WAS ALSO SURVEYING SOME 27 SITES, FOR INCLUSION ON THE SUPERFUND LIST. THESE EVENTS, AND OUR OVERALL THREATS TO GROUNDWATER, PROVIDED THE IMPETUS FOR PASSAGE OF MAJOR GROUNDWATER PROTECTION LEGISLATION, THE WATER QUALITY ASSURANCE ACT OF 1983.

IN SUMMARY, THE ACT:

- ESTABLISHED A STATEWIDE GROUNDWATER MONITORING NETWORK, AND A DATA COLLECTION AND REPOSITORY PROGRAM.
- THE ACT ALSO ESTABLISHED A WELLFIELD CONTAMINATION PREVENTION PROGRAM.
- IT DIRECTED ALL ARTESIAN FREE-FLOWING WELLS TO BE PLUGGED BY 1995.
- IT CREATED A PESTICIDE REVIEW COUNCIL.
- THE ACT CREATED A REGULATORY PROGRAM FOR ABOVE- AND BELOW-GROUND STORAGE TANKS DESIGNED TO ELIMINATE THE CHRONIC THREAT TO FLORIDA'S GROUNDWATER.
- THE ACT ESTABLISHED A PACKAGE PLANT INSPECTION PROGRAM AND PROVIDED $100 MILLION FOR CONSTRUCTION OF SEWAGE TREATMENT PLANTS.
- IT ALSO CREATED A PROGRAM TO PROMOTE PROPER DISPOSAL OF SMALL QUANTITIES OF HAZARDOUS WASTE.
- IT ALSO REQUIRED A STATEWIDE ASSESSMENT OF HAZARDOUS WASTE, AND THE SITING OF AREAS BY EACH COUNTY WHERE HAZARDOUS WASTE TRANSFER STATIONS COULD BE LOCATED.
- IN ADDITION, THE ACT REQUIRED THE SITING OF A MULTIPURPOSE HAZARDOUS WASTE FACILITY.

- THE ACT PROHIBITS DISPOSAL OF HAZARDOUS WASTE INTO LANDFILLS OR INTO UNDERGROUND FORMATIONS.

- IT ALSO REQUIRED A PERMIT FOR THE CLOSURE OF LANDFILLS. LANDFILL REQUIREMENTS WERE FURTHER STRENGTHENED BY PERFORMANCE STANDARDS ADOPTED BY THE 1985 FLORIDA LEGISLATURE.

- THE ACT ALSO HAS PROVIDED SOME $30 MILLION OVER THREE YEARS FOR CLEANUP OF HAZARDOUS WASTE SITES AND POLLUTANT SPILLS.

A TOTAL OF 63 HAZARDOUS WASTE SITES ARE UNDERGOING PHYSICAL CLEANUP, MOST BY RESPONSIBLE PARTIES. ACTIVE GROUNDWATER CLEANUP IS CURRENTLY UNDERWAY AT 12 OF THOSE SITES. RECOVERY OF PETROLEUM CONTAMINANTS IS UNDER WAY AT ANOTHER 48 SITES IN FLORIDA, AND HAS BEEN COMPLETED AT 37 MORE. ACTUAL GROUNDWATER TREATMENT IS UNDERWAY AT 18 OF THE PETROLEUM CONTAMINATION SITES.

WHEN WE SPEND MONEY TO CLEAN UP TOXIC WASTE, WE ORDINARILY SEEK REIMBURSEMENT FROM THE RESPONSIBLE PARTIES. HOWEVER, A RECENT COURT DECISION ON THE SILVEX SITE IN FLORIDA, WHERE THE U.S. NAVY WAS ONE OF THE RESPONSIBLE PARTIES, PREVENTS STATES FROM RECOVERING FUNDS WHEN THE RESPONSIBLE PARTY IS THE UNITED STATES. EFFECTIVE IMPLEMENTATION BY STATES OF THEIR ROLE IN THE SUPERFUND PROCESS IS SEVERELY HINDERED WHEN FEDERAL FACILITIES ARE HELD "ABOVE THE LAW" IN HAZARDOUS WASTE CASES.

OUR STATE FUND, WHILE ADEQUATE NOW, WILL BE DEPLETED IN TWO YEARS. IN ADDITION TO CLEANUP FUNDS, WE SEE THE NEED FOR A VICTIM'S COMPENSATION FUND, REGARDLESS OF WHO CAUSED THE CONTAMINATION. THIS IS ESPECIALLY NEEDED FOR INDIVIDUALS WHOSE WELLS ARE CONTAMINATED BY GASOLINE. ONE MAJOR PROBLEM HERE IS THAT INSURANCE COMPANIES ARE UNWILLING TO PROVIDE "NON-SUDDEN" LIABILITY INSURANCE FOR NON-HAZARDOUS WASTE STORAGE TANKS. WHILE OUR STATE

LAW REQUIRES FINANCIAL RESPONSIBILITY FOR SUCH FACILITIES, WE ARE HAVING DIFFICULTY DEVELOPING A RULE FOR IMPLEMENTATION.

MCLs--ANOTHER CONTAMINATION PROBLEM WHICH SERVED AS A CATALYST IN DEVELOPMENT OF FLORIDA'S GROUNDWATER PROGRAMS WAS THE DISCOVERY OF LARGE-SCALE CONTAMINATION OF GROUNDWATER BY ETHYLENE DIBROMIDE (EDB). THIS CARCINOGENIC PESTICIDE CONTAMINATED ABOUT 10 PERCENT OF SOME 8,000 PRIVATE AND PUBLIC DRINKING WATER WELLS TESTED IN HIGH RISK AREAS. THIS LED TO THE BANNING OF EDB IN FLORIDA, AND ULTIMATELY NATIONWIDE LARGELY BECAUSE OF CONCERN OVER CONTAMINATED GRAIN.

IN ADDITION, FLORIDA HAD HAZARDOUS WASTE SITES WHICH WERE LEACHING TOXIC ORGANIC CHEMICALS. THESE ISSUES, AND THE FACT THAT DEVELOPMENT OF FEDERAL STANDARDS WAS CONSTANTLY BEING DELAYED, LED FLORIDA TO ADOPT NUMERICAL STANDARDS FOR EIGHT CHEMICALS IN BOTH RAW AND TREATED DRINKING WATER.

MAJOR CONTAMINANTS--IN ADDITION TO ADOPTION OF THE MCLS, FLORIDA ESTABLISHED A PROGRAM FOR SAMPLING OF 118 POTENTIAL CONTAMINANTS. THE DRINKING WATER RULES REQUIRE TESTING, EVERY THREE YEARS, FOR COMMUNITY AND NON-COMMUNITY WATER SYSTEMS.

EXPERIENCE WITH PROGRAM TO DATE

I HAVE DESCRIBED SOME OF OUR EXPERIENCES IN IMPLEMENTATION OF THE GROUNDWATER RULE AND CLEANUP UNDER THE WATER QUALITY ASSURANCE ACT, AND NOW I'D LIKE TO HIGHLIGHT SOME WITH THE DRINKING WATER TESTING PROGRAM. I THEN WILL TOUCH ON GENERAL PROBLEMS WE ENCOUNTER.

EXPERIENCE WITH THE STANDARDS--SINCE THE 600 LARGER DRINKING WATER SYSTEMS WITH MORE THAN 1,000 CONNECTIONS WERE REQUIRED TO REPORT TEST RESULTS FOR THE NEW MCL'S BY JUNE 1, 1985, AND THE REMAINDER OF THE CHEMICALS REQUIRED TO BE TESTED BY JANUARY 1, 1985, WE NOW HAVE SOME EXPERIENCE.

THERE HAVE BEEN PROBLEMS WITH RELIABILITY OF ANALYSES REPORTED THUS FAR. OF THE EIGHT RESPONDENTS REPORTING POSITIVE TEST RESULTS FOR THE MCLS, THE FLORIDA DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES FOLLOWED UP AND ALL EIGHT WERE ACTUALLY NEGATIVE. THAT AGENCY HAS NOW ADOPTED A CERTIFICATION PROGRAM FOR LABORATORIES TESTING FOR VOCS AND SYNTHETIC ORGANICS, WHICH SHOULD HELP ASSURE MORE RELIABILITY OF THE ANALYSES.

ONLY ABOUT 425 OF THE 600 SYSTEMS REQUIRED TO REPORT BY JUNE 1 AND JANUARY 1 HAVE ACTUALLY DONE SO. WE ARE FOLLOWING UP WITH THE REST NOW. ABOUT THREE PERCENT OF THE SYSTEMS IN THE STATE ARE EXPECTED TO HAVE PROBLEMS WITH VOLATILE ORGANIC COMPOUNDS.

GENERAL PROBLEMS--

- JURISDICTION OVER LAND USE--WHILE LOCAL GOVERNMENT, BY DESIGN, HAS THE MAJOR RESPONSIBILITY FOR ZONING, A KEY ELEMENT IN PREVENTION OF GROUNDWATER PROBLEMS IS TO LOCATE FACILITIES IN APPROPRIATE LOCATIONS AND REDUCE THE THREAT OF CONTAMINATION. PROPOSED CHANGES TO OUR GROUNDWATER CLASSIFICATION SYSTEM WILL HELP US EXERCISE MORE INFLUENCE OVER LAND-USE DECISIONS.

- CONFLICT IN AGENCY RESPONSIBILITIES--THE EDB EXPERIENCE IS AN EXAMPLE OF THE AWKWARDNESS OF HAVING PESTICIDE REGULATION IN ONE AGENCY AND CLEANUP RESPONSIBILITY IN ANOTHER. THIS OCCURS IN MOST STATES. ESTABLISHMENT OF THE PESTICIDE REVIEW COUNCIL UNDER

THE WATER QUALITY ASSURANCE ACT OF 1983 HAS HELPED BRIDGE THE GAP THROUGH DER REPRESENTATION ON THE COUNCIL.

- LACK OF RESOURCES--MONITORING CAN BE VERY EXPENSIVE. ANALYSIS OF JUST ONE SAMPLE FOR A PRIORITY POLLUTANT CAN COST BETWEEN $1,000 AND $1,200. HOWEVER, THE GENERAL SCANS WE REQUIRE FOR INITIAL SCREENING ARE MUCH MORE INEXPENSIVE.

- QUALITY ASSURANCE--THERE IS NO LABORATORY CERTIFICATION PROGRAM FOR CHEMICALS OTHER THAN THOSE LISTED FOR DRINKING WATER STANDARDS.

IN ADDITION, WE DON'T HAVE ABSOLUTE CONFIDENCE IN GROUNDWATER QUALITY DATA THAT'S BEING GENERATED BY INDUSTRY AND OTHER OUTSIDE SOURCES. WE ARE CONFIDENT OUR GROUNDWATER QUALITY MONITORING NETWORK WILL HELP PROVIDE US WITH A SOLID DEPENDABLE DATA BASE THAT WILL ALSO HELP FILL THE GAP.

- TREND ANALYSIS--INTERPRETATION OF DATA WHICH IS COLLECTED WILL BE A MONSTROUS JOB. AND TREND ANALYSIS, TO DETERMINE WHAT THE DATA MEAN ON AN OVERALL ENVIRONMENTAL QUALITY LEVEL, WILL ALSO BE REQUIRED. HOWEVER, THE FEDERAL GOVERNMENT SHOULD BE ABLE TO HELP US WITH THESE FUNCTIONS. IN TURN, THIS LEADS TO CONSIDERATION OF PROPER STATE AND FEDERAL ROLES IN GROUNDWATER PROTECTION.

FEDERAL ROLE IN GROUNDWATER PROTECTION

GROUNDWATER PROTECTION ACT

AS YOU ARE AWARE, THERE HAVE BEEN A NUMBER OF ACTIVITIES AT THE FEDERAL LEVEL DEALING WITH THE ISSUE OF NATIONAL GROUNDWATER PROTECTION. I CURRENTLY SERVE ON THE CONSERVATION FOUNDATION

AND NATIONAL GOVERNOR'S ASSOCIATION NATIONAL GROUNDWATER POLICY FORUM CHAIRED BY GOVERNOR BRUCE BABBIT AND THE ENVIRONMENTAL AND ENERGY STUDY INSTITUTE'S GROUNDWATER WORKING GROUP CHAIRED BY RUTH PATRICK. ALTHOUGH THESE EFFORTS ARE NOT COMPLETE, THEY MAY PROVIDE YOU WITH MORE OF A CONSENSUS THAN IS CURRENTLY POSSIBLE. THE FOLLOWING ARE GIVEN AS MY VIEWS.

GROUNDWATER PROTECTION ACT

THERE IS A NEED TO ADOPT A NATIONAL GROUNDWATER PROTECTION ACT. IT SHOULD HAVE A GENERAL GOAL DESIGNED TO PROVIDE MAXIMUM PROTECTION FOR AQUIFERS WHICH ARE OR COULD BE USED FOR DRINKING WATER. THE LEVEL OF PROTECTION PROVIDED A DRINKING WATER AQUIFER MAY VARY FROM STATE TO STATE, BUT SHOULD NOT BE BELOW A MINIMUM ESTABLISHED BY THE EPA.

THE CURRENT EPA GROUNDWATER PROTECTION STRATEGY IS BUILT ON EXISTING PROGRAMS WHICH ARE NOT SPECIFICALLY DESIGNED TO PROTECT GROUNDWATER. EPA NEEDS A SEPARATE GROUNDWATER PROGRAM WHICH OVERLAYS ALL EXISTING PROGRAMS. THE FEDERAL PROGRAM SHOULD INCLUDE TECHNICAL AND FINANCIAL SUPPORT FOR STATES. ALSO, THE FEDERAL PROGRAM SHOULD INCLUDE NON-POINT SOURCE CONTROL--ESPECIALLY FOR PESTICIDES AND FERTILIZERS. IN ADDITION, SEVERAL INSTITUTIONAL, LEGAL AND INTERSTATE ISSUES NEED TO BE ADDRESSED.

STANDARD SETTING--MINIMUM STANDARD SETTING IS ONE OF THE FEW GROUNDWATER RELATED ACTIVITIES THAT LENDS ITSELF TO GENERALIZATION TO ALL STATES. WHAT IS CARCINOGENIC IN FLORIDA IS ALSO CARCINOGENIC IN NEW MEXICO. THE CONGRESS SHOULD INSTRUCT THE EPA TO EMBARK ON A "MANHATTAN PROJECT" STYLE EFFORT TO DEVELOP MCLS FOR TOXICS IN SOIL, AS WELL AS DRINKING WATER. CONGRESS SHOULD SPECIFY A REASONABLE MAXIMUM TIME ALLOWED FOR GENERATING THE DATA AND

AN ANNUAL REPORTING REQUIREMENT ON PROGRESS BY EPA. IT IS PAINFULLY OBVIOUS THAT NO ONE STATE CAN CARRY OUT SUCH A PROJECT ON ITS OWN.

RESEARCH AND DEVELOPMENT--ANOTHER AREA OF TECHNICAL ASSISTANCE OF GENERAL UTILITY TO ALL STATES IS RESEARCH AND DEVELOPMENT. THE FIELD OF GROUNDWATER MANAGEMENT AND PROTECTION IS A RELATIVELY YOUNG ONE. LITTLE IS KNOWN ABOUT THE FATE OR BEHAVIOR OF GROUNDWATER CONTAMINANTS OR THEIR IMPACT ON HUMAN HEALTH.

FINANCIAL SUPPORT

MOST, IF NOT ALL THE STATES, SUPPORT THE CURRENT EPA POLICY WHICH LEAVES IMPLEMENTATION OF THE GROUNDWATER PROGRAM TO THE STATES. THE MAJORITY OF THOSE STATES, HOWEVER, WILL FIND IT HARD TO DO SO WITHOUT FINANCIAL ASSISTANCE FROM THE FEDERAL GOVERNMENT.

- THE EPA SHOULD SEEK ADEQUATE FUNDING FROM CONGRESS FOR ASSISTING STATES IN DEVELOPMENT OF GROUNDWATER PROGRAMS.
- FUNDING SHOULD ALSO BE DIRECTED TO STATES WITH EXISTING PROGRAMS TO HELP CONTINUE AND IMPROVE IMPLEMENTATION OF THESE PROGRAMS.

NONPOINT SOURCE POLLUTION CONTROL, ESPECIALLY PESTICIDES

PERHAPS BECAUSE OF THE COMPLEXITY OF THIS ISSUE, AND THE FRAGMENTATION OF RESPONSIBILITY AMONG FEDERAL, STATE AND LOCAL AGENCIES, NONPOINT SOURCE POLLUTION HAS BEEN NEGLECTED. OUR EXPERIENCE WITH PESTICIDES IN GROUNDWATER IN FLORIDA HAS CERTAINLY BEEN SOBERING. TECHNICAL AND INSTITUTIONAL COORDINATION BETWEEN THE FEDERAL AND STATE GOVERNMENT IS NEEDED.

POLLUTION OF GROUNDWATER WITH PESTICIDES IS MADE THAT MUCH HARDER TO MANAGE BY VARIATION IN THE BEHAVIOR OF THE SAME CHEMICAL

UNDER DIFFERENT SOIL AND AQUIFER CONDITIONS. THE EPA SHOULD REQUIRE SPECIFIC FIELD STUDIES ON THE BEHAVIOR OF PESTICIDES IN THE LOCALITIES WHERE THEY ARE TO BE USED PRIOR TO LICENSING THEIR USE.

THESE STUDIES MUST OBVIOUSLY BE CLOSELY COORDINATED WITH THE STATES.

INSTITUTIONAL, LEGAL AND INTERSTATE ISSUES

- A CLEAR FEDERAL ROLE IS TO ASSIST IN THE RESOLUTION OF INTERSTATE DISPUTES INVOLVING AQUIFERS AFFECTING MORE THAN ONE STATE.
- THE FEDERAL GOVERNMENT SHOULD IMPROVE ITS USE OF THE EXISTING SOLE SOURCE AQUIFER.

PROVISIONS.

- THE FEDERAL GOVERNMENT SHOULD CONSIDER ACQUISITION OF SENSITIVE OR UNIQUE AQUIFERS, SUCH AS HIGH RECHARGE AREAS, FOR WILDLIFE REFUGES OR PARKS.
- THE FEDERAL GOVERNMENT SHOULD USE FINANCIAL INCENTIVES AND DISINCENTIVES TO PROMOTE EFFECTIVE STATE GROUNDWATER PROGRAMS.

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STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Testimony of Robert E. Moore, Assistant Deputy Commissioner
Connecticut Department of Environmental Protection
State Office Building
Hartford, Connecticut 06106
June 20, 1985

Providing safe drinking water to Connecticut citizens is the primary goal of the state's ground water management program. Approximately one-third of our 3,100,000 people rely on ground water for their water supply source. Over half of these rely on individual household wells for drinking water without any benefit of routine water monitoring to assure potability. Although 94% of Connecticut's ground waters are known or presumed to be uncontaminated, the 6% which is contaminated or thought to be contaminated effects tens of thousands of Connecticut's citizens. We fully expect the incidences and extent of contamination will increase along with the number of people impacted as we look for new pollutants and detection abilities increase. The most recent evaluation of ground water contamination reveals the following

Wells affected by contamination (1978 to April 1, 1985)

	Type of Contamination						
Type of Well	Pesticides	Solvents	Landfill Leachate	Hydrocarbons Gas & Oil	Salt	Other	Total
Domestic	283	156	134	77	43	33	726
Public Community	47	44	1	7	4	10	113
Public Non-Community		55	4	19	8	3	89
Total	330	255	139	103	55	46	928

[These incidences represent 220 separate sites and about 150,000 people, (2200 people affected by the 726 domestic wells). "Other" category includes nitrates, phenol and heavy metal contamination.]

Ground water protection in the fourth most densely populated State and a State which has been industralized since colonial days requires careful balancing of the conflicting needs for water supply and waste disposal. Connecticut's statutory goal for water quality requires that the "public health and welfare be protected, economic development promoted and the quality of the waters be preserved and enhanced for present and future use for public water supply, agriculture, industrial and other legitimate uses". To achieve this goal and balance the competing uses, Connecticut chose not to develop a separate or distinct ground water program but rather to integrate ground and surface water management into a single consistent program. The inseparable relationship between the ground and surface waters had to be recognized in water quality and quantity policy, planning, and standards in order to assure achievement of the goal and to reflect our knowledge gained of the resource and demands on it. It was readily determined that individual local programs could

not achieve the goals set because each of our 169 towns could not provide or protect ground water to meet their supply demands nor could they each provide for proper wastewater disposal and other legitimate uses within their boundaries.

However, local planning, zoning and enforcement was determined necessary for proper implementation and management of parts of the system. A system of state ground water quality standards and criteria paralleling the surface water quality standards was determined to be workable and effective, could be developed in a timely fashion, would require public involvement and could assure consistency in all federal, state, and local permit actions.

A specific ground water policy was developed to reflect its finite role of the legislative water quality goal. Standards of use rather than standards of quality were chosen for a variety of reasons including; flexibility to react to changing drinking water standards and new types of pollutants; the ability to prohibit in select areas certain discharge and land use practices; to ease enforcement and simplify monitoring; to encourage consideration into local zoning and aquifer protection programs; and to provide consistency with statuatory goals.

The resultant Policy and use standards are as follows:

"It is the policy of the State to restore or maintain the quality of the ground water to a quality consistent with its use for drinking without treatment. In keeping with this policy, all ground water shall be restored to the extent possible to a quality consistent with Class GA. However, restoration of ground water to Class GA shall not be sought when:

A) The ground water is in a zone of influence of a permitted discharge.
B) The ground water is designated as Class GB; unless there is demonstrated need to restore ground water to a Class GA designation or where it can be demonstrated to the Commissioner that restoration to Class GA can be reasonably achieved.
C) The ground water is designated Class GC."

Four classifications of ground water are established in the standards.

I. GAA-a) Existing or proposed public drinking water use without treatment (includes some general quality limits).
b) Areas classified as GAA may be suitable to receive discharges of domestic sewage or wastes from acceptable agricultural practices or clean water discharges.
c) All ground waters in existing and proposed public water supply watersheds are classified as GAA. For graphic purposes a distance or radius of 1,000' around all existing public water supply wells is also classified GAA.

II. GA -a) May be suitable for public or private drinking water use without treatment (includes some general quality limits).

b) Areas classified as GA may be suitable for discharges allowed in GAA areas and septage (septic tank pumpings) and other wastes of human or animal origin. Such waters may also receive discharges of substances of natural origin or materials which easily biodegrade in the soil system and pose no threat to untreated drinking water supplies.

c) The majority of the State falls into this classification because no discharges inconsistent with this class presently exist to those ground waters.

III. GB-a) May not be suitable for public or private use as drinking water without treatment since the ground waters are known or presumed to be degraded.

b) Areas classified as GB may be suitable for receiving discharges allowed in Classes GAA or GA and in addition certain treated industrial process waters. There must be no violation of adjacent surface water standards and such discharges should not preclude the future use of the ground waters for water supply.

c) Ground waters classified as GB are located in areas where historical industrial or residential development has or is likely to render these ground waters unsuitable for drinking. These areas are generally under all of our densely developed urban areas.

IV. GC-a) May be suitable for certain waste disposal practices because land use or hydrogeologic conditions render these ground waters more suitable for receiving permitted discharges than development for public or private water supply.

b) Class GC areas may be suitable for all discharges allowed in areas designated as Class GAA, Class GA, Class GB. Class GC areas may be suitable for other discharges operating under a discharge permit, as long as such discharges will not cause a violation of an adjacent surface water classification, and will not impair other inherent rights for potable ground water.

c) There is present and continuing need to allow discharges to the ground which are currently best treated by making use of the restoration or attenuation characteristics of the soil and subsurface hydrogeologic conditions. The best places to meet this need in Connecticut exist in limited areas of the State where specific land use and hydrogeologic conditions exist that may be most favorable to the acceptance of such discharges. Those areas generally have greater than 10' of unsaturated fine grain deposits and the existing land uses are compatible with such discharges. In many Class GC areas, the historic waste disposal practices may have, for all practical purposes, permanently rendered the ground water unsuitable for drinking water without treatment, and/or the development of large yield and high quality water supply from the aquifer conditions is unlikely. A limited number of such areas exist throughout the State, but it is in these areas where we will consider and encourage landfill siting and other significant ground discharges.

The Water Quality Standards were adopted in 1980 and all the ground waters were classified into one of these standards over the following five years by major river basin areas. The second classification is underway, with one basin completed. The classification also sets requirements for achieving higher standards where desired goals were not being met.The water quality standards results in classifing 22% of the land area of the state as GAA, 73%-GA, 4%-GB, 0.3%-GC. It should be noted that the 0.3% of the state falling in our GC class is not sufficient to provide for the landfilling of our future garbage thereby forcing other solutions to this problem.

The standards and classification meet our objective of developing a management program which would achieve stated goals. They provide for protection and enhancement of public and private water supply and other legitimate uses. A variety of definitions, criteria, additional policies were needed to clarify specific allowable or prohibitive practices. One very significant policy is related to the control of a plume or zone of influence of a permitted discharge. Connecticut law prohibits the permitting of pollution but allows the permitting treatment systems designed to prevent pollution. Any discharge to the ground water, including septic systems, will alter the quality. A policy was developed to define the zone of influence boundaries and furthermore require control of the land area over the zone. The projected zone or plume is permitted in whole as the treatment system and the permittee must own or have easement to the land in order to operate and maintain the treatment system. This simple policy meets the law, protects other water uses or water rights from being taken or abused, assures long term control over pollution sources especially landfills, lagoons, and hazardous wastes facilities, and simplifies monitoring.

The classification of ground waters and water quality standards do not in themselves permit the discharge of wastes compatible with the standards but do prohibit imcompatible discharges. The vigorous permit process must be followed for all discharges. To obtain a permit in consistent with the classification, the complete process of reclassification must occur and be adopted prior to consideration of the proposed permits.

The development of these ground water standards could not have been achieved with out extensive mapping of the hydrogeologic features of the state and land uses. These include the till-stratified drift contact, bed rock, depth, water table, basin divides, areas greater than 10' of unsaturated stratified drift, areas of greater than 40' of saturated drift,and grain size distribution. In addition all waste water discharges to surface and ground water, salt piles, lagoons, oil and chemical spills, landfills and all public water supply wells and reservoirs were also mapped. All the information was used together in developing the classification. We are now digitalizing all this information in cooperation with USGS in a new Geographic Information System which will allow wide spread use of all the information developed through computer plotting. It will also allow for rapid revision of the standards.

Clearly prevention of contamination must be the main element of any ground water management program as it is in Connecticut through these water quality standards, but other key elements must include enforcement, and pollution abatement processes, control of water withdrawal or use, monitoring and research. The classification of our ground water has been effective in controlling new discharges and siting facilities. It has also refocused our water quality management program to deal with solving the conflicts identified by the classification (GB/GA or GB/GAA) and described by a basin plan.

In the work required to develop this system, it became clear that our management program lacked several key tools which were needed to meet the goals being set.The first was the control of ground water withdrawal. In 1982 the Department prepared and submitted to the General Assembly a bill requiring a permit for the diversion of surface or ground water over 50,000 gallons per day. This bill was adopted as Connecticut's Water Diversion Policy Act of 1982 and provides to the Department the authority to allocate the state's water resources and control uses in consistent with the classification.

Several other additions to our statutory authority for enforcement and regulation beyond the present authorities requiring permits for wastewater and leachate discharges were needed and subsequently pursued and adopted in 1982. They include:

1. The authority to ban by regulation the use of toxic substances or priority pollutants in septic system additives and cleaners. Regulations requiring product labeling and prohibitions have been adopted.

2. The authority to set standards by regulations for the design, installation, testing and removal of underground fuel and chemical storage tanks. Regulations have been through the administrative process and are awaiting final adoption.

3. The authority to delegate Department authority to local municipal agents or agencies. This allows development of local ground water protection programs with a strong statutory basis. Delegation of programs to towns will include: administration of underground fuel storage regulations, additional review and permit of large septic systems (only single residential and small commercial are now delegated), expanded rights of investigation and monitoring, and control over many commercial activities.

4. The authority to require persons or municipalities who have polluted a water supply well to provide potable water to the affected persons. This law is a very important and powerful tool designed to get safe drinking water to the people as soon as possible while the months or years of cleanup activities go on. Where a responsible party is unknown or has no assets the Commissioner may order the town to provide potable water and provide to the town grants for 100% of the cost of bottled water and engineering and 50-75% of the costs for long term solutions.

Funds for the program are derived for at a State hazardous waste generators tax, licensing and registration fees for pesticides and pesticide applicators and portion of the gross earnings tax on the sale of petroleum products.

Connecticut's ground-water program direction for the future is towards prevention through control of land uses by state ground water standards and classifications and by development of comprehensive local aquifer protection programs. Our development efforts today are aimed at providing education, training, and assistance to towns in establishing needed land use controls and establishing locally enforceable performance standards for small commercial and industrial establishments (gas stations, laundromats, dry cleaners, etc., and home industries such as photo developing, printing, etc.).(see "Protecting Connecticut's Ground Water - A Guide to Ground Water Protecting for Local Officials" by Connecticut Department of Environmental Protection).

In developing the data bases for our classification the department identified approximately 40 regional aquifers capable of producing over 5 Million gallons per day which were not in public water supply use and not fully protected by the standards. To protect these significant aquifers two programs to quantify specific yields and define land use controls needed to preserve these resources are now underway. The land use controls being studied range from state acquisition to local zoning controls.

The tools are in place in Connecticut to carry out an effective management program at the state and soon local level. While enforcement tools are capable of solving today's problems, the lack of national drinking water standards for pesticides and other toxic, hazardous and carcinogenic substances hinders and some cases halts problem resolution and stifles anticipation and prevention of future problems. National standards for maximum contaminant levels and understandable and useable risk factors must be promulgated as soon as possible to define safe drinking water. Connecticut and Massachusetts both have set different standards for EDB resulting in wells only a few miles apart being contaminated in one state but safe in the other with the same concentrations of the pesticide.

EPA's "Ground water Protection Strategy" strongly suggests a broad ground water use classification system be used by all EPA programs involving regulated activities which potentially affect ground water quality. I support this strategy and while the classification system proposal must be fine tuned,tunedrefined, the potential merits of its use in RCRA, Superfund, UIC, pesticides management and other federal programs is significant in terms of protection of important ground waters and consistency between regulated activities. There are two areas of major concern with the implementation of the strategy which are brought about by the lack of specific legislative authority. The first is that the strategy can only be used to guide permit or clean up decisions on a case-by-case basis and will not protect the ground water resources of the country as a whole contrary to what Congress has required for surface waters. The second is that because the states may not be

determining the classification of the ground water on a site or may disagree with the federal decision, conflicts with EPA and the states will be inherent in the process. These two issues will become major problems.

I thank you for this opportunity to discuss Connecticut's ground water management program with you and hope it has been of some assistance. Attached to this testimony are two documents, the Water Quality Standards, and the local guide referenced earlier. Classification maps and resource maps are also available if needed.

Robert E. Moore
June 20, 1985

GROUND WATER CONTAMINATION AND PROTECTION

TUESDAY, JULY 16, 1985

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON TOXIC SUBSTANCES AND
ENVIRONMENTAL OVERSIGHT,
Washington, DC.

The subcommittee met at 10:12 a.m., in room SR-485, Russell Senate Office Building, Hon. Dave Durenberger, chairman of the subcommittee, presiding.

Present: Senators Durenberger, Abdnor, Baucus, Burdick, and Mitchell.

OPENING STATEMENT OF HON. DAVE DURENBERGER, U.S. SENATOR FROM THE STATE OF MINNESOTA

Senator DURENBERGER. The hearing will come to order.

Today, we hold the third in our series of hearings on ground water protection. The subject matter of this hearing is the ground water protection strategy of the Environmental Protection Agency, which was officially announced in August of last year. This strategy is part organization and part classification.

Organizationally, EPA has created an Office of Ground Water Protection which will seek to coordinate the efforts of other EPA offices and other Federal agencies. It will also encourage the States to target existing grant dollars, particularly dollars from various clean water grants, toward ground water protection.

The heart of the strategy is the classification. Under the EPA's strategy, aquifers would be divided into three classes.

Class I, or special ground water, is those aquifers which are highly vulnerable to contamination, and which either provide an irreplaceable source of drinking water or supply water to a sensitive and valuable environmental resource.

Class II aquifers are all current and potential sources of drinking water.

Class III aquifers include those ground waters already contaminated by salt and other minerals to the point that they are not expected to have any potential use.

My understanding is that the largest portion of all aquifers will be categorized as class II, or drinking water aquifers.

As I read the strategy, it says that these resources are to receive the protection afforded by existing law and regulation. The strategy produces no changes in approach.

Class I, or special ground waters, are to receive special protection. For instance, the strategy document suggests that EPA may

write regulations that will ban the siting of hazardous waste disposal facilities above class I aquifers.

Finally, the strategy recommends that class III aquifers be afforded lesser protection than would be provided by current law and regulation.

Superfund will not be used to clean up sites that discharge to class III aquifers. Waivers against other program standards might also be contemplated.

To date most of the discussion of the EPA strategy, which, I say again, is little more than this classification scheme, has focused on the plan to write off class III aquifers. There is a very great danger that we will be making irreversible decisions to destroy an environmental resource without sufficient knowledge and forethought to make the right decision every time.

I have joined in that criticism. We do not need a Federal ground water strategy if the principal result is only to tell us which aquifers we can ruin. Congress ought to put that kind of a strategy out of our reach. But, perhaps, we are focusing too much on the dangers of the dirty end of the classification scheme. There is also, I think, a danger at the other end of the scheme, in the strategy for protecting special ground water. That is the danger of lost opportunity.

We may put so much effort into mapping and planning for stringent protection of a limited set of resources that we forego the opportunity to better protect the vast resource which is all of the usable ground water of this nation.

I tend, too often, to sit up here and make black and white distinctions when most of the world really is shades of grey. The distinction that I am trying to make now is between a strategy that places the emphasis on classification of aquifers and one that places the emphasis on control of potential sources of contamination.

There are 16.6 million septic tanks in this country. There are millions of underground storage tanks. There are hundreds of thousands of miles of pipeline. There are 181,000 surface impoundments, 93,000 landfills, millions of acres of farmland doused with pesticides and fertilizer at regular intervals. Those numbers tell the ground water problem.

If I were doing a Federal ground water strategy, I don't think I would put much effort into classifying aquifers, that really is the job of the State and local governments. The job for the Federal Government is to get the sources of contamination under control, and you don't have to take my word for that. The U.S. Code is full of chapters with just that purpose—regulating sources of contamination.

What we have failed to do in the past, and the reason we need a strategy to focus our efforts, is that we have insufficiently understood or examined the role of ground water as a source of human exposure to toxic contaminant, and as the unique environmental medium with natural laws of its own.

Although I have these differences with the strategy that has been announced and articulated by the EPA, I want to say that I am also greatly encouraged by the effort and the dedication that many individuals are putting into the ground water program. It is

a very complex and it is a contentious subject. Anyone who is willing to carry the EPA flag into the middle of the battle day after day must earn our sincere admiration.

The folks at the EPA Ground Water Office should be pleased with the debate that is underway. They are leading the rest of us into a fuller understanding and appreciation of the ground water question, so we should welcome the strategy as a starting point and join with them in designing a national commitment to protect this vast and valuable resource.

Senator Burdick, do you have any opening comments?

Senator BURDICK. Not at this time.

Senator DURENBERGER. Senator Mitchell.

Senator MITCHELL. Thank you, Mr. Chairman, I do.

I commend you for the interest that you have demonstrated in this subject and I look forward to working with you on it.

I want to welcome all of the witnesses today, and extend a special welcome to State Senator Judi Kany from my State of Maine, who will be testifying today. Senator Kany is the chairperson of the Maine State Legislature's Committee on State Government, and is a member of the Committee on Energy and Natural Resources. She has been a leader on environmental and other issues, and is currently chairperson of a special commission set up by the State to study and recommend solutions to this difficult problem of disposal of low level radioactive waste in Maine. She is here today representing the Council of State Governments, and I very much look forward to hearing her testimony as well as that of the other witnesses.

The focus of today's hearing is the EPA's ground water protection strategy, and I have several concerns about that strategy. First, I am concerned that it simply strings together a number of existing programs without providing for a coordinated and comprehensive approach to ground water protection. I am also concerned that the classification system outlined in the strategy is not sufficiently protective of ground water quality. I am concerned that the EPA has not provided adequate funding to implement several important aspects of the strategy at the Federal and State level.

I look forward to hearing both sides of these and other issues from the witnesses today. While I do not agree with everything in the strategy, I do want to compliment the EPA for taking the initiative to develop a program for ground water protection. The strategy has helped to highlight the importance of ground water protection and serves as a useful vehicle for the debate of the difficult issues involved in this effort.

I also recognize that the EPA persevered in the development of this strategy in the face of complacency and outright opposition from others in the administration.

Mr. Chairman, I look forward to the testimony.

Senator DURENBERGER. Thank you very much.

Our first witness is Henry L. Longest, the Acting Assistant Administrator for Water of the U.S. Environmental Protection Agency.

Henry, we welcome you. Your full statement will be made part of the record, and you may proceed.

STATEMENT OF HENRY LONGEST, ACTING ASSISTANT ADMINISTRATOR FOR WATER, ENVIRONMENTAL PROTECTION AGENCY, ACCOMPANIED BY MARIAN MLAY, DIRECTOR, OFFICE OF GROUND WATER PROTECTION

Mr. LONGEST. Thank you very much.

I am going to give summary testimony, rather than the full statement, and I appreciate your entering that into the record.

I have with me this morning Ms. Marian Mlay, who is the Director of the Office of Ground Water Protection at the Environmental Protection Agency.

EPA has taken the initiative in developing a ground water protection strategy that provides a framework for a wide range of new, as well as existing, activities by various programs in the agency. We appreciate this opportunity to discuss the status of its implementation.

The strategy reflects an agency-wide effort to ensure the protection of this important resource. In its development, we took a number of factors into consideration. First, States have the primary responsibility for the protection of ground water. Second, a broad range of Federal statutes exist which protect this resource and support the State efforts. Third, science and technology in this area are rapidly expanding. Fourth, the risk to public health and environmental effects are not fully understood.

I would like to summarize briefly the objectives, as stated in the ground water strategy. There are four goals.

The first is to create consistent EPA program policy. The second is to give emphasis to sources of contamination that appear to be of particular national concern. The third, coordinating the development and implementation of EPA policy among the Headquarters, Regions, and other Federal agencies. Fourth, to strengthen the capacity of State governments to manage ground water protection program.

The implementation of the strategy is well underway. To provide a focus for activities related to ground water protection, EPA created the Office of Ground Water Protection in the Office of Water in April 1984. It is now staffed and operating.

The Ground Water Office has a cross-program purpose. It is responsible for working with Headquarters and Regional programs in developing consistent ground water policies, and to provide a focus within EPA for ground water protection concerns.

I would like to highlight the status of a number of activities that we have undertaken in the program.

First, one of the major concerns addressed in this strategy is the need to achieve greater consistency among the many EPA programs related to protection of ground water, and to take the value and relative vulnerability of ground water resources into account in agency decisionmaking.

To accomplish this goal, the agency needed a policy or operational tool that would guide ground water decisionmaking among the Agency's program offices to ensure consistency in ground water priorities and direction. Therefore, EPA adopted a protection policy for the Ground Water Protection Strategy which will minimize the

risk to human health and the environment, while realistically protecting the resource.

This policy provides base level protection for most ground water. To these ground waters, EPA would then apply current protection approaches, gearing our efforts so that the highest beneficial use, drinking water, would be protected.

The strategy also recognizes that some ground waters deserve greater protection than others due to their particular use, relative value to society, and geohydrologic vulnerability.

This approach has been recognized by many States as a logical and protective way of managing ground water. The approach is now being developed into a three-tier classification system for use by EPA programs. It should be emphasized that EPA will use the classification system primarily as a tool in ground water protection and site-by-site decisionmaking.

The Office of Ground Water Protection is working with EPA program offices in defining appropriate protection and cleanup strategies for different classes of ground waters. These will be reflected in the agency guidance and in future regulations for programs such as RCRA, CERCLA, and the Underground Injection Control Program.

We expect draft classification guidelines to be published in the Federal Register in November 1985, and our target is for final guidelines to be released in the Spring of 1986.

The second area that we deal with is emphasizing the sources of contamination of critical national concern. A major goal of the Ground Water Protection Strategy is to help focus agency efforts on several particular sources of ground water contamination needing greater emphasis such as pesticides, underground storage tanks, and landfills. I would like to briefly discuss these areas.

Pesticides have been found in ground water in at least 23 States. Contamination by 16 different pesticides can be attributed to normal agricultural practices. In late 1984, EPA issued an order requiring manufacturers of pesticides to provide environmental fate this information on an accelerated basis so that a complete data base will be available for evaluation. By the end of this year, EPA will have received certain key environmental fate information on all pesticides the agency believes are the most likely to leach into ground water.

The Agency is developing a pesticide monitoring survey to provide a national picture of the extent of the presence of pesticides in drinking water drawn from ground water, as well as the geological and use conditions that affect migration of pesticides into ground water.

Finally, the Administrator has created a working group, cochaired by the Office of Pesticide Programs and the Office of Ground Water Protection, to review EPA's overall efforts to prevent pesticide contamination of ground water, and EPA's responsibility for remedial action if contamination occurs.

Underground storage tanks.—Millions of underground storage tanks are used to store a wide variety of liquids, including gasoline, domestic fuels, hazardous and toxic chemicals and wastes. A recent chemical advisory notified owners and operators of gasoline service

stations of the problems associated with leakage from underground gasoline storage tanks.

Also, in response to the strategy, a national survey is underway to test a representative group of tanks to determine the extent and cause of leaks from tanks containing petroleum products.

Finally, in response to the Hazardous and Solid Waste Amendments, the Office of Solid Waste has begun a major program addressing this important environmental issue.

Toxic substances.—The Office of Toxic Substances and the Office of Ground Water Protection are working together to determine how the Toxic Substance Control Act, TSCA, may be used to provide information on ground water contamination from toxic substances such as TCE and other volatile organic compounds, and to control situations which pose significant health or environmental risks.

Technical information documents.—We will be developing documents designed to help address ground water contamination problems which are within the province of State and local governments. The Office of Ground Water Protection is initiating a series of technical information documents. The first will address one area that has already been mentioned here today, septic tanks and their impact on ground water.

The third area I would like to cover is coordinating, development, and implementation of ground water protection. A major effort in achieving the objectives of the strategy will be coordinating and implementing the ground water protection policies across program lines and with other Federal, State and local agencies.

The Office of Ground Water Protection uses several mechanisms for carrying out this task. One is in the area of ground water monitoring and information management.

We are developing a ground water monitoring strategy which will articulate what information the Agency and States need for decisionmaking, and how such information can best be collected and by whom.

In the areas of research, the EPA Science Advisory Board established a committee to assess EPA's ground water research efforts and determine future research activities and areas of emphasis.

The final set of coordinating mechanisms relates to other Federal agencies. To assure good general communication, the Inter-Agency Group on Ground Water Protection has been established, with representatives of Federal agencies with responsibilities related to ground water protection. We are also negotiating specific efforts to be carried out by other agencies.

For example, the Department of the Interior and EPA have concluded negotiations on a memorandum of understanding governing the relative roles and responsibilities of EPA and the U.S. Geological Survey.

The last area I will briefly cover is strengthening State programs. Strengthening State programs is the first goal cited in the strategy. Many States are now developing innovative and sophisticated ground water programs of their own, however, more needs to be done.

I believe the committee is aware that in the 1985 budget, EPA has distributed $7 million to State agencies to develop ground

water programs, and the same amount is available in the President's budget for fiscal year 1986. These grants range from $50,000 for territories to between $100,000 to $380,000 for State agencies.

The States use these funds to develop and enhance ground water management strategies, institutional building, monitoring programs, developing classification and data management systems, designing control programs, and conducting an assessment of pollution impacts on their resources.

Finally, a substantial area of State need is the development of new knowledge about ground water quality. The Office of Research and Development, along with USGS and other agencies, is expanding efforts in this direction.

In summary, as you can see, the Environmental Protection Agency has taken substantial steps toward implementing the Ground Water Protection Strategy. As this work continues to intensify, the agency is confident that the Nation's vulnerable ground water resource will receive the protection that it so critically requires.

Thank you for the opportunity to address this subcommittee and I will be happy to answer any questions that you have at this time.

Senator DURENBERGER. Let me start with a question on the Office of Technology Assessment. Their ground water report identifies 32 sources of ground water contamination, and it indicates that only some of those are currently regulated. Has the EPA developed an agenda for regulation, and which sources and/or chemicals have been targeted as a priorities for such an effort within EPA?

Mr. LONGEST. I can't say specifically that I can hand you an agenda that we have developed, but I can say that we have been attacking the problems that are most prevalent, for example, the pesticides that I have mentioned. The pesticide program is to identify each chemical that is a problem, if they are in addition to the 16 that we already know about.

We are also looking at our guidance documents to deal with specific issues such as septic tanks; working with our RCRA program to deal with landfills and the impact they have on ground water.

We are approaching this mainly from the standpoint of what the known problems are today. Our next step would be, of course, to lay out a total agenda, but we do not have that at this time.

Senator DURENBERGER. If I asked you today to give me a status report on the 32 sources, you could do that, but there is not a specific agenda next to most of those 32 sources for action. Is that your answer?

Mr. LONGEST. That is correct.

Senator DURENBERGER. Many of the witnesses who testified at the previous subcommittee hearing, which focused on State, local, and regional efforts, indicated that it was their desire that we have some minimum Federal requirements for ground water protection programs.

Do you plan to establish a minimum requirement for contamination prevention as part of proposed regulatory changes directed at protecting ground water and, if you are, under which existing authorities?

Mr. LONGEST. The minimum protection would come under the specific authorities. As you are probably aware, there are six laws

that EPA deals with that can protect and provide protection for ground water. As you are also aware, we do not have an overall program that we have asked the States to establish to follow certain guidelines, but we would have minimum protection as it deals with specific issues. Ours is a cross-cutting minimum protection program, and that leads to our approach to that through the classification system that you spoke of earlier, with the three-tier approach to classification.

I would like to emphasize that the idea of the EPA classification system is not something that we would say States should adopt. The idea of the classification system is a tool that we have developed to make decisions specifically within EPA, whether it be in the Superfund cleanup, the RCRA program, the pesticides, and what-have-you with the classification system that we can make a decision up to what level a certain resource should be cleaned. This is in contrast to States who are developing their own classification systems which in most cases delineate and define the entire resource. These classification systems can have anywhere from two to up, the highest number I have heard, to seven classes.

I guess the short answer is, we are approaching protection program by program, problem by problem, rather than with an overall minimum standard because we feel that the States clearly have the authority and the responsibility for the protection of ground water.

Senator DURENBERGER. The strategy states that EPA will provide technical assistance to the States, but is somewhat vague on the particulars. Will such technical assistance take the form of, for example, minimum source control guidelines for any currently unregulated sources, regardless of the extent of major contamination problem?

Mr. LONGEST. When you speak of minimum source control, my mind goes to requirements or standards for drinking water, for example. Our mode of regulation under the Safe Drinking Water Act, which includes ground water, is at the tap. So there will be standards at the tap for drinking water. In surface water, we have water quality standards, and there are not water quality standards for ground water per se.

Senator DURENBERGER. The provision of technical assistance to the States will require compatible efforts, I take it, within the Office of Research and Development. The strategy indicates that the agency supports a strong research and development effort. Our problem is that, aside from Superfund related activities, the budget seems to contradict the strategy's emphasis on research and development.

My question is, what R&D efforts are now on-going that would provide a basis for technical assistance with such things as prevention and control of contamination from identified sources of ground water pollution?

Mr. LONGEST. I would like to make a general comment, and then ask Marian to address the specifics on that.

The general comment is that over the last year, in developing this MOU, for example, with USGS and the Department of the Interior, we recognize their expertise in how ground water travels. We feel that with their expertise, they can help in determining how large a problem we have in a particular aquifer, while we feel

that our expertise within EPA is the quality of the ground water. So we tried to separate those two issues so that we are not duplicating what each other is doing.

In terms of the budget, as stated in the testimony, we have created this Ground Water Protection Office, and we have comparable offices in the regions. We have put the money in the Office of Water. So I think that we have moved in terms of providing resources for ground water.

One of the principal purposes of this office is to coordinate and to pull together what our other program offices are doing, and not necessarily be a program office in itself. It is to draw upon the expertise of the other offices and the authorities that we have.

Specific technical assistance we will be providing includes guidance documents and technical assistance documents. We work with our own R&D people in terms of defining the characteristics and state and effect of chemicals, what happens to chemicals when they get into the ground water. This work is to tie into R&D at the USGS. The USGS deals with where ground-water travels and how long it takes to get there.

Senator DURENBERGER. I understand all of that. The strategy says, we need research and development on these quality issues, but the budget seems to contradict that. My question is, do you already have a lot of R&D available that will be helpful in developing quality guidelines, or do we need more money and more R&D to provide answers to what happens to the pesticides as they go down through the system.

Ms. MLAY. There is a considerable amount of research going on right now in the Agency. We have about $15 million worth going into fate and transport work, much of it taking place in Ada, OK, at our laboratory there. They have some fairly innovative work. Some things that are going on right now can be used directly for technical assistance to the States. For example, there is some fairly major work on aquifer restoration, and some fairly major work on defining aquifer vulnerability. There are a substantial number of things occuring at Ada.

They have also a fascinating and, I think, very, very important piece of research going on with Stanford University in which one of the scientists, John Wilson at Ada, has discovered a way of cleaning up TCE in-site using the naturally occuring microorganisms that are actually in the ground. The activated microorganisms are enabling them to break down TCE, leaving no residue. This has tremendous implications. It is extremely good work. A demonstration project that is going to be starting with Stanford very shortly.

The laboratory at Athens has been extensively expanded. They are doing a fair amount of work, mainly at the root-zone levels, with the pesticide program. They are looking at models to see how various kinds of pesticides react as they leach into the ground water, which ones stay and which ones don't. There had been very little work in this area and that has expanded. It seems to be going well.

Our Las Vegas laboratory has also expanded its work in ground water monitoring, specifically monitoring technology. They have been working with NASA to try to use some fairly sophisticated technologies.

I think there is fairly creative work going on, and between the 1985 and the 1986 budget estimates that I am aware of, the ground water research budget has jumped from about $11 to $15 million. So there is an actual increase.

In addition, we have another $10 million or so in what we call "indirect resources." This involves mainly technical work that deals with liners, landfills, and things of that sort, rather than the ground water flow and transport. So between $21 and $24 million is now going into ground water and ground water related research.

As Henry mentioned, there is a Ground Water Protection Research Review Committee composed of an independent groups of scientific experts that the EPA Science Advisory Committee was asked to establish. EPA John Quarles is the chairman that. They are just finishing up their work, they are just about ready to give us a draft report. We should have something from them within the next month or month-and-a-half that we can share.

Senator DURENBERGER. Thank you.

I yield to my colleague from North Dakota.

Senator BURDICK. Thank you, Mr. Chairman.

Welcome to the committee.

Mr. LONGEST. Thank you.

Senator BURDICK. In your statement you say:

> One is in the area of ground water monitoring and information management. The Office of Ground Water Protection is developing a ground water monitoring strategy which will articulate what information the agency and States need for decisionmaking, and how such information can best be collected and by whom. A proposed strategy should be completed this summer.

I want to read that again, "A proposed strategy should be completed this summer."

I have been on this committee for a good many years, and we have had this problem for a good many years. Why is it that a strategy is not yet completed?

Ms. MLAY. There has, within the last year-and-a-half, been a requirement by the Agency to develop strategies, monitoring strategies, for various individual programs. This has been done for RCRA and the Safe Drinking Water Programs as well as other EPA programs offices. These stragtegies detail individual types of monitoring information that relates to their specific statutory requirements.

The reason that we have not done on overall Agency strategy before is because OGWP didn't exist. This overall strategy trys to look across the board in the Agency and say, OK, there are a lot of common needs among our programs for information. There are other agencies, like the USGS, that can provide some of it. How can we assess all of the current monitoring activities and see what is missing, what kind of information the Agency might need beyond that which is currently collected for individual programs.

That is the purpose of that strategy, to look more holistically at the Agency's monitoring need, rather than focusing on individual programs and what monitoring they need to do for their regulatory efforts.

Senator BURDICK. Unless we have a total strategy, how do we go before the Appropriations Committee and get the required amount of money, if we don't have a blueprint?

Ms. MLAY. Certainly that is one of the reasons we are working as hard as we are on it. We see that it is a very necessary piece.

Senator BURDICK. You have been at this for a number of years.

Mr. LONGEST. The strategy that we talk to, monitoring specifically for ground water, is fairly recent. Yes, the Agency, for a number of years, has been developing various strategies for monitoring surface water, or specific programs may have strategies for their own monitoring, but our issue, as Marian stated, is trying to pull these all together so that we can specifically relate them to ground water. That is a fairly recent issue that we have been dealing with.

Senator BURDICK. Ground water contamination is recent?

Mr. LONGEST. Monitoring specifically, looking at ground water, and a monitoriing strategy specifically for ground water, I said, is fairly recent. We have had monitoring strategies for many other programs.

Senator BURDICK. There is another area. As you know, we have the finest industry in the world in which we have no competitor, and that is the agricultural industry. It is one industry that we excel in. Here I am caught in a dilemma. What do we do about insecticides? We can't engage in good agriculture if it is all eaten up by the bugs.

My question is, are you working on some kind of an insecticide that is not toxic and still will do the job?

Mr. LONGEST. I can't speak for all of EPA, but to my knowledge, we are not working on developing an insecticide within EPA. I don't see that as EPA's charge.

Senator BURDICK. Is anybody working on it? We are dealing now with the food supply.

Mr. LONGEST. I can't say. I am not aware of anyone working on it.

Senator BURDICK. I think that is very, important because we have to have the food supply and we can't have contamination in the waters. I agree with both premises, and certainly there has to be some way to have them both.

Mr. LONGEST. Yes; we have become painfully aware recently as we have strived with the nonpoint source problem, dealing with runoff from agriculture and other sources, that in some cases, if you get into certain practices that are promoted, you may, in effect, be creating other problems in ground water by retaining water and forcing it down into the soil.

We realize that there is a dilemma there, but clearly we do not have the answer now.

Senator BURDICK. Certainly, it is easier to identify leakage from metal tanks; it is easier to identify them, gasoline tanks that rust out, but it is something more difficult to determine runoff from land because some of the runoff is good for the soil, and some is not good for the soil.

I think that we have a dilemma here that we have to work on. How do we maintain the food chain and do it in a safe way.

Thank you.

Senator DURENBERGER. Senator Mitchell.

Senator MITCHELL. Thank you, Mr. Chairman.

Mr. Longest, one of the most important objectives outlined in the EPA strategy is assistance to States in the development and imple-

mentation of their ground water protection programs. The strategy indicates that EPA will provide both grant and technical assistance to States, and I have a series of questions about both topics.

Mr. LONGEST. Yes.

Senator MITCHELL. I understand EPA made some $7 million available to States in 1985 to support development of ground water programs and that about the same amount is available in in 1986.

Mr. LONGEST. That is correct.

Senator MITCHELL. That figure is substantially below the State assistance level for surface water and hazardous waste programs which are on the order of $50 million a year.

Mr. LONGEST. That is correct.

Senator MITCHELL. My first series of questions, and I will ask them all and you can answer them all in one narrative. How did you arrive at the $7 million figure? Was the decision to make $7 million available based on an assessment of the needs of States for assistance in ground water program development, or was it imposed internally on some other basis? Have States indicated a need for expanded assistance? If you have not already done so, does the EPA plan to conduct an assessment of State needs for grant assistance?

Mr. LONGEST. First, the $7 million, as a brief background, is distributed under Clean Water Act authority we have for State program grants, section 106 of the Clean Water Act. The money was appropriated by Congress. Congress specifically gave us the $7 million, it was not requested, for the ground water program. It was not based on a needs assessment that we did. That same amount of funding was carried forward in the President's budget for fiscal year 1986. That is how we got the $7 million figure.

The second part of your question dealing with, have we done a needs assessment, no, we have not done a needs assessment of State needs to run ground water programs. At this time, we have not planned to do a survey of State needs. We have been concentrating on the strategy itself, and what we need to do in terms of technical assistance. Our biggest effort currently is the guidelines for how to deal with ground water problems and make decisions.

Senator MITCHELL. On the subject of technical assistance, then, could you describe for me what the agency has done to organize and direct technical assistance the States need, and have you been able to convince other Federal agencies to provide other technical assistance to States if appropriate?

Mr. LONGEST. The key to the first part, dealing with what have we done and what are we doing, is the guidelines that we are developing. Draft guidelines will be published in the Federal Register in late November 1985 and will deal with how to make a decision on the level of protection for a given site specific ground water. In other words, our system of three classes is a tool, and the guidelines will specifically show ways that a decision can be made, whether it is a land use decision or whether it is a decision to clean up an existing problem decisions. The guidelines will go into the details on how to make these decisions.

Over the next month, we will be going around to all of our regional offices and discussing the specifics of the system.

In terms of other agencies, we have spent a great deal of time at the USGS, the U.S. Geological Survey, and the Department of the Interior, because of the expertise they have in monitoring ground water. In the memorandum of understanding with DOI, they have agreed that there are certain things that USGS will do, and also that they will provide some technical assistance to States. We have encouraged States to call on the U.S. Geological Survey to assist them in mapping of ground water.

At this point in time technical assistance consists of two items: the USGS work we have done and the development of the classification guidelines for decisionmaking in the planning protection, or cleanup of ground water sources.

Senator MITCHELL. The recent study of ground water contamination by the Office of Technology Assessment included recommendations that EPA develop data on the toxicology and health effects of a wide range of contaminants found in ground water. Many States are in the process of developing State standards for ground water and need this information.

My first question on this subject is: What is the Agency's view on the need to develop better data on ground water contaminants to support State standard setting?

Mr. LONGEST. The first part of that is the drinking water standards which we are developing in four phases. As you aware, as part of phase I, we proposed nine volitile synthetic organic chemical standards. RMCL's were proposed in mid-1984 and MCL's are scheduled for proposed later this summer. In phase II, RMCL's for approximately 40 inorganic chemicals and synthetic organic chemicals, including pesticides and microbiological contaminants are now in first Agency review.

Maybe Marian can help me here, I do not know chemicals in the listing that was put out by the committee that you speak to, whether each of those has been addressed.

Ms. MLAY. I would have to offer that for the record, I really couldn't say. We do have some additional work going on in the Pesticides Office, looking at ways to require more environmental information from manufacturers through an accelerated data call in. This will provide information on the health effects of the various pesticides that are likely leachers.

We are also exploring, via a TSCA strategy that we are developing with the Office of Technical Assistance and Office of Toxic Substances, how the Agency can use the section VIII of TSCA to gather additional health and ground water related that kind of information from manufacturers.

[Information requested follows:]

Question. How many total contaminants are you considering as part of the Drinking Water Standards?

Answer. The Office of Drinking Water published two ANPRM's, one at 47 Federal Register 9352 (1982), and the second at 48 Federal Register 45502 (1983), listing a total of 85 contaminants. The Agency is currently in the process of deciding which of these will be regulated by MCL's.

Senator MITCHELL. The strategy refers to the existing drinking water health advisories as a method of providing contaminant information to the States. Is the health advisory system adequate, in your judgment, to provide States with ground water contaminant

data, and how many ground water related health advisories have been issued this year?

Mr. LONGEST. The health advisory system in itself is not adequate. The more important thing is developing the standards where they are necessary for particular contaminants, and that is what we are doing.

The health advisory is one step down from a standard. Basically, how we come up with a health advisory, when we discover a problem with a particular chemical, generally working through the Research and Development Office. At that point use all the existing materials that are available for that chemical and the best minds that we can gather together to quickly come up with an advisory. That is exactly what it is, a quick information advisory based on the best information we have today. That is very different from developing a standards where we go through what could be up to a 3-year study to assess the risk and the exposure of a chemical before we actually propose a standard, a comment period and then come up with the final MCL.

So the health advisory is something, that in many cases, may be all that we need because there is enough information. I wanted to distinguish between health advisories and standards. Specifically, how many we have issued this year to address ground water, I cannot answer.

Senator MITCHELL. You could supply that for the record later.

Mr. LONGEST. Sure.

[The information requested follows:]

Question. How many ground water related Health Advisories have been issued this year?

Answer. We are updating and revising all existing Health Advisories and will be issuing 40–50 Health Advisories by the end of this fiscal year.

Senator MITCHELL. I understand that EPA has formed a work group to review the use of the Toxic Substances Control Act and the ground water program. This is an important and overdue initiative, and I would like to ask if you know when the work group will issue a report, and request that you provide a copy of that report to the committee.

Ms. MLAY. We are still working on drafts. The report will probably not be ready for another month or two.

Senator MITCHELL. Will you provide a copy to the committee?

Ms. MLAY. Yes.

[The following is in response to Senator Mitchell's request:]

Question. Will you please submit a copy of the TSCA Ground-Water Strategy to the Subcommittee.

Answer. We will provide a copy of the Strategy to the Subcommittee when it is completed later this Fall.

Senator MITCHELL. I have another series of questions, and then I have a fairly lengthy list of questions for other witnesses. I want to ask about the classification system. The strategy outlines a three-tier classification system for ground water protection, and the strategy further outlines how each of the EPA programs will be applied to ground water in each class.

The strategy has been criticized by some because it establishes different classes of ground water and implies that we will not do all that we can to prevent pollution. I have an additional concern

with the classification system and I would like to have your comments on it.

I am concerned that even if we all agreed on the classes, and which waters belong in which class, the strategy does not appear to provide any clear method of assuring that waters actually meet the specified use.

For ground water class II, drinking water, we are simply told that EPA will continue to implement existing programs. There is no indication of what the EPA would do if these waters are found not to be suitable for drinking even with the implementation of existing programs.

My first question is: What is EPA's policy for those cases where water, which is for drinking, fails to meet that quality even if all the controls in existing statutes are in place?

Mr. LONGEST. First, I would like to restate that the EPA classification system is a tool for the agency to make decisions on what actions it has to take, for example, Superfund clean up sites.

States have, in many cases, their own systems today. Their classifications go from 2 classes of ground water up to, the largest number I know in terms of classification classes. We are not trying to say that this should be a national classification system in terms of how a State should identify their waters and their uses. What we are trying to say is that, if we have to take an action within EPA, whether it would be a site clean up or whether it related to a pesticide found in ground water, we would look to this system to determine how much effort we feel we should put in to cleaning up that ground water.

For example, let's say that a ground water source fell into the third category, that is, it is not a known drinking water supply, and to our knowledge, it is not intended to be a drinking water supply, then there may not be any effort needed to clean up that source if it became contaminated versus something that was found in the class II, which is a known drinking water supply, and we had to go in and make a decision on cleanup. We would balance whether total clean up of that source is the appropriate action to take, or whether we will have to substitute another drinking water supply.

That is the way we would use the system as a tool in making decisions on actions the agency has to take, not trying to tell the States how they should classify their water and what usage should be placed upon those classes.

Senator MITCHELL. Have you considered developing contaminant concentration standards to define the level of quality needed to meet each of the uses defined in the three classes of ground water?

Mr. LONGEST. I think I can safely say that we have considered it, but I would also have to say that we have not gone very far along on that consideration, understanding what we have been through in the area of surface water standards. It would be a very difficult task, there is no question about it. I don't know that it would be best to spend our time on that at this point in time.

Senator MITCHELL. May I take your answer to mean that you have considered it and rejected going forward on it at least at this time?

Mr. LONGEST. I guess that would be fair, but there was no formal decision written, "We hereby reject this." I am just saying that it has been discussed, but we have put our priorities in other areas.

Senator MITCHELL. Thank you.

Mr. Chairman, I thank you, and I will submit the remainder of my questions in writing to the witnesses.

Senator DURENBERGER. Thank you.

Let me say, Mr. Longest, I don't think that we have time this morning to explore that last series of questions, but it is extremely important. I listened to your response to George's questions, and it seems to me that it is sort of a distinction without a difference. I am not being judgmental, I think that we are still in doubt about exactly what you mean when you say that you are using it as an internal tool. I would expect that maybe when we get to one or more of the witnesses who are dealing with where the States are at in this system, they would like to know more clearly the answer to that question as well.

I have a couple of questions along this line, though. First, whether or not the philosophy underlying the classification is one of limited degradation. Couldn't it be interpreted to encourage degradation, as you use it as a tool, by allowing what we might call protection distinctions to be made on the basis of beneficial use. You said something about, these are not drinking water aquifers.

If we use the analogy of the Clean Water Act, if we happen to have the Federal mandate for high quality that was associated with fishable and swimmable waters, I doubt whether designated uses would have driven the program in the direction of nondegradation.

Can you help me a little bit on this issue of nondegradation versus degradation? Where is that as a principle in this classification system?

Mr. LONGEST. In the classification system, the nondegradation can be taken into consideration, but it is not a focal point of the system. Again, the system is based on the existing or the potential use of the ground water resource, and what actions the agency takes to maintain that current use or maintain that quality for potential use.

I think that one difference, principally, between ground water for drinking water and surface water, is that in ground water, it is known that many aquifers are just, because of salinity or whatever, not appropriate and never will be appropriate for drinking water. Then there are also aquifers that are used by the oil and gas industry for putting brines down in the formations. Then there are aquifers that would not be used, or there was never any intention that they would ever be used for drinking water.

So the distinction that I am trying to draw here is, as I saw the philosophy of the Clean Water Act, all surface waters were available for use. They are right there and anybody can get to them. Ground water, you get down to different strata, some very deep, and don't feel that there is an intention for those ground waters to be used as a drinking water supply. That is as close as I can come to drawing a distinction between clean waters.

Senator DURENBERGER. One other question, and what we are going to have to do here is, maybe, blend some of our questions so

that the subcommittee can get back as definitive a set of replies as possible.

This question deals with how amenable a particular resource is to translation into general criteria for three classes. Special ground waters include irreplaceable sources of drinking water or ecologically vital resources which are vulnerable.

Is it your experience thus far that one can actually say that this particular resource is this increment more irreplaceable or ecologically vital than that one? Are those relative values so clear, across the country or even within a State, that there would be widespread agreement on it?

Mr. LONGEST. Not always clear, but in some cases, yes, they are clear. For example, if you have a sole source aquifer, and it is the drinking water supply for a large population, then clearly there is not a substitute water supply and it could fall into that category.

By the same token, an example would be, if you have an aquifer under a very sandy soil, that may be a special aquifer in terms of vulnerability, anything you put on the soil, on top, will definitely get down into the aquifer, versus an aquifer that has some——

Senator DURENBERGER. So your answer is that some are and some aren't.

Mr. LONGEST. Yes.

Senator DURENBERGER. You mentioned the sole source aquifer. Have you looked at the relationship between sole source aquifers and critical protection areas as we have set them out in the Senate Safe Drinking Water Act amendments and class I or class II waters?

Mr. LONGEST. I know what you are speaking of, but not specifically that relationship, no, I have not.

Senator DURENBERGER. You might.

In terms of technical assistance to the States, does the agency intend that mapping and classifying of aquifers will be a part of these activities?

Mr. LONGEST. We do not see that as anything that we would be requiring. That is not our effort. Many States do that themselves, but that would not be something that would come out of this, either the system for the classification or come out of the guidelines. We are not requesting that, asking that, or suggesting that.

Senator DURENBERGER. Are you providing any technical assistance to the States?

Mr. LONGEST. The U.S. Geological Survey would be the experts on mapping.

Senator DURENBERGER. Max, do you have any questions?

Senator BAUCUS. Thank you, Mr. Chairman.

Mr. Longest, as I understand it, basically EPA is saying that the States should have the responsibility for protecting ground water or preventing ground water pollution. Is that right?

Mr. LONGEST. Right.

Senator BAUCUS. Second, I understand that you are saying that EPA has developed this classification system for the different classes of ground water. The question is: If States have the responsibility, what good does it do to have a Federal classification system? What assurances are there that the States will set up the same classification system?

Mr. LONGEST. The concept here is not for the States to set up a classification system to parallel any classification system to be set up by EPA. The purpose of the EPA system is somewhat different than what the States set up. The States set up their classification system to characterize the entire ground water resource in the State according to whatever uses it has. We are setting up a system to help us make decisions on EPA programs at specific sites whether it be hazardous waste, RCRA, pesticides, or whatever, that we have to make in terms of spending Federal dollars. For example, cleaning up a source.

The system is a tool for EPA staff to make site specific decisions. It is not something we would expect the States to pick up on and parallel.

Senator BAUCUS. Do the States have the resources to either clean up or prevent?

Mr. LONGEST. I can't speak State by State.

Senator BAUCUS. Generally.

Mr. LONGEST. I don't know.

Senator BAUCUS. Is there a danger that your classification system will allow pollution havens, that is, some States will set up standards that will allow more pollution than some others?

Mr. LONGEST. I don't think so. That clearly is not the intent of it. The intent of it is to identify what sources are used for drinking water, and what level of protection we should provide in various programs that are authorized in current statutes.

Senator BAUCUS. If the States have primary responsibility, won't that allow some States to be pollution havens?

Mr. LONGEST. It is a difficult question. I guess the best I could say is that it probably wouldn't prevent that.

Senator BAUCUS. I am sorry.

Mr. LONGEST. I said, it is a difficult question, the best I can say that it probably wouldn't prevent that.

Senator BAUCUS. Should there be either Federal legislation or Federal regulatory action which, if not to prevent that, at least significantly discourages that?

Mr. LONGEST. There is appropriate legislation now to protect ground water. Then when you get to this concept of pollution havens, resources such as ground water are classified because we know that some ground water could never be used for drinking water, if it is saline. The concept that we are trying to put forth is, if there is a ground water resource, an aquifer that could not possibly be used for drinking water, such as certain States where you have oil and gas drilling, and they put brines down into aquifers, deep aquifers that are not suitable for drinking water, it is an appropriate use of that aquifer, if that is the State's determination. I wouldn't call that a haven for pollution, if that determination is made by a State.

Senator BAUCUS. In answer to a question asked by Senator Mitchell, you said that EPA is employing the use of TSCA to provide information on contaminants. My question is: Why hasn't EPA used that authority earlier, since TSCA has been on the books for at least 10 years?

Mr. LONGEST. I think that we have just become more aware of the problems we have out there. The other thing is, that the Office

of Ground Water Protection was just established approximately 1 year ago. We really have only just begun with this issue of cross-program coordination that we are undertaking.

Senator BAUCUS. Could you briefly tell me the difference between class I, class II, and class III aquifers.

Mr. LONGEST. I will start with class III.

Senator BAUCUS. Very briefly.

Mr. LONGEST. OK, let me start in the middle. Class II is a known or potential drinking water source. That would be the majority, probably, of the ground water. If you go below that, it would be a source, as I mentioned, that is saline, aquifer that could never be used for drinking water.

Senator BAUCUS. That is class III.

Mr. LONGEST. Right. The top one could also be drinking water, but it has other special characteristics, or it is extremely vulnerable.

Senator BAUCUS. To what?

Mr. LONGEST. To pollution, for example, if it is right below sandy soil, so practically anything you put on top would get to it immediately. So we deal with the issue of sensitivity and vulnerability in class I.

The class II may be just as important a water supply, but it is more protected geologically from materials getting down into it. So the first classification is, yes, drinking water that is very sensitive, very vulnerable.

Senator BAUCUS. I know that we have to go slowly because it is a very difficult area, but I get the feeling that we could go a little more quickly, and I encourage you to go more quickly. I think that the public is also going to urge you to go more quickly, too, because if we don't, I suspect that we are going to wake up and find that we have been derelict and we should not have been.

Thank you.

Senator DURENBERGER. Senator Abdnor.

Senator ABDNOR. Thank you, Mr. Chairman. I have no questions.

Senator DURENBERGER. Thank you very much for being here. I understand that you have to get ready for the markup on water resources.

Senator ABDNOR. Yes; I have an important water bill coming up.

Senator DURENBERGER. It is important to all of us, and thank you for being here.

Thank you very much, Henry and Marian, for your testimony.

Next we have a panel of five people; Ms. Judy Kany, who has already been introduced by her Senator, she is the Maine State senator representing the Council of State Governments; Mr. Charles Johnson, technical director of the National Solid Waste Management Association; Ms. Velma Smith, director of the Ground Water Protection Project of the Environmental Policy Institute, who also represents the National Resources Defense Council; Mr. Mark Maslyn, the assistant director of the National Affairs Division of the American Farm Bureau; and Ms. Linda Bochert, who is the executive assistant to the secretary of the Wisconsin Department of Natural Resources.

The testimony of each of the witnesses, as written and submitted to the committee, will be made part of the record, and each of you

may proceed now, in the order of your introduction, to summarize your testimony. You each will have 5 minutes in which to summarize that testimony. A little green light goes on when you start, and a little red light goes on when the 5 minutes are up. We give points against future appearances for people who stay within their time limits.

We will start with Ms. Kany.

STATEMENT OF JUDY KANY, MAINE STATE SENATOR, REPRESENTING THE COUNCIL OF STATE GOVERNMENTS

Ms. KANY. Thank you, Senator Durenberger, Senator Baucus, and my own distinguished Senator, Senator Mitchell.

Good morning. My name is Judy Kany. I am a State senator in Maine. I am speaking on behalf of the Council of State Governments, a private, nonprofit agency of all State governments, created, supported, and directed by them. The council conducts research on State programs and problems, maintains an information service available to State agencies, officials, and legislators, and issues a variety of publications, assists in State/Federal liaison, promotes regional, State and local cooperation, and provides staff for affiliated organizations.

As a State senator, I have served as the senate chairman of Maine's Joint Standing Committee on Energy and Natural Resources. I presently serve on the Environment Committee of the Eastern Region of the Council of State Governments. Additionally, I have been involved in ground water and other environmental issues, such as underground tanks, for some time, and I have sponsored various legislation in Maine on these issues.

The Council of State Governments requested review comments on EPA's draft ground water protection strategy from the Governors, the legislative environmental committee chairs in the 50 States, and the U.S. territories. Responses were obtained from 33 States and three territories. The accompanying report is divided into two parts. The first part provides overall document review notes. The second part consists of documents and information received from the States. Overall, the States seem pleased that EPA had begun taking concrete steps toward the protection and management of the Nation's ground water. All States indicated a keen awareness of the value of the ground water resource.

As might be expected, funding was a major concern. The use of set-aside moneys from current programs was generally not favored. The States are already taking on a larger share of the costs for environmental programs. The question of where the dollars to make up for reduced 106 or 205(j) funds would come from is a valid one. As one State indicated, ground water is a significant enough issue to warrant its own funding.

In a related area, the use of funding for State program development was also questioned. Many States that have moved ahead with ground water program development felt that their initiative was being penalized. Second, many States felt that the activities excluded are precisely those activities which are most critical to program success and which the States could least afford to cover alone.

A second area of concern had to do with the somewhat nebulous nature of the strategy. Several States asked for specific guidance in the form of minimum ground water standards. Such standards, they argued, will allow States to be more stringent as necessary. However, such standards would also recognize ground water as a resource which, like surface water, is no respecter of political boundaries and which, if misused in one State, can adversely impact neighboring States.

Related comments dealt with the aquifer classification itself. While the categories and definitions need refinement, a number of States question how such a classification could be implemented. Some additional precision is clearly necessary, especially if State classification programs are going to have to be at least as stringent as the Federal for purposes of receiving delegation under RCRA.

As Wisconsin suggested, any classification system should be based on the vulnerability to contamination rather than use.

Finally, a number of States complained of not only the tardiness of this strategy, but also the lack of State input. Discussion of the need for an EPA ground water strategy has abounded since the late seventies. Indeed, in about 1980, it appeared, based on a series of meetings in Reston, VA, that such a strategy would be forthcoming. This comment has bearing on the tone of the report which frequently implies that ground water has been perceived only recently to be a problem.

Of perhaps more concern, however, is the total lack of State input in the development of this strategy. Many States have made significant and innovative strides toward the development and implementation of ground water management and protection programs, their expertise and experiences could have been fruitfully utilized in the development of the EPA strategy. If nothing else, failure to include the States in the development of the strategy raises some fundamental questions about how EPA intends to fulfill the promise of State/Federal partnership espoused by the Administrator.

Thank you for this opportunity to speak before you this morning.

Senator DURENBERGER. Thank you.

Senator Mitchell has a requirement to be in the Finance Committee, so I am going to yield to him for the purpose of asking a couple of questions.

Senator MITCHELL. Thank you, Mr. Chairman.

By coincidence, another person from Maine is to testify before the Finance Committee in a few moments, and I have to be there to introduce that witness.

I would like to commend Senator Kany for her testimony, and ask just a couple of questions. I apologize to the other witnesses in advance, but I will review their testimony in the record.

Ms. Kany, one of the key issues in the development of a national ground water policy is the degree of flexibility allowed State programs and the degree to which Federal minimum standards are established.

Does the Council of Governments survey address this issue, and did the survey indicate areas which should be left to the States and areas where Federal minimum standards are needed?

Ms. KANY. Yes, thank you, Senator Mitchell. A number of States commented, on their own volition, on the need for the minimum Federal standards, but they do want to see more stringent standards allowed just to take advantage or to take into consideration individual States and regional characteristics.

For instance, our own State of Maine has ground water very near the surface. We have a considerable amount of ground water, in fact, about 20 times the amount of surface water and, of course, the quality of the ground water also impacts upon the quality of the surface water.

We have only about 1 million in population, and just as the average State does, ground water provides about 50 percent of Maine's drinking water. It is extremely important that we have minimum standards, so that industries will not choose to shop for the least control. A particular ground water aquifer may not currently be used for drinking water purposes, but in the future it may be used for such.

It is interesting to note that we often concentrate on public water supplies. Yet public water supplies, a goodly percentage, use ground water. Private water supplies are dispersed throughout all States and are generally dependent upon ground water quality.

There is a call throughout the United States for minimum standards.

Senator MITCHELL. EPA has indicated that the classification system set forth in the strategy will not be forced on the States. Are the States concerned that the application of the classification system to Federal programs, which have been delegated to the States, would involve a de facto requirement that States implement the classification system?

Ms. KANY. Certainly, with such a classification system there would be pressure from many sources to have a uniform Federal classification system. I think there is particular concern from the States about a classification system that would allow further degradation, as opposed to concentrating on the issue of vulnerability.

Senator MITCHELL. Thank you very much, Senator Kany.

Thank you, Mr. Chairman. I thank the other witnesses.

Senator DURENBERGER. Mr. Johnson.

STATEMENT OF CHARLES JOHNSON, TECHNICAL DIRECTOR, NATIONAL SOLID WASTE MANAGEMENT ASSOCIATION

Mr. JOHNSON. Thank you, Senator. I appreciate the opportunity to appear before you today.

My name is Charles A. Johnson, and I am the technical director of the National Solid Waste Management Association, which is the trade association of the companies that provide the service of treatment and disposal of wastes that we call hazardous or nonhazardous to industry and people of the United States.

It has been well established, I think, that whenever substances are placed on the ground or in the ground, they have the potential for contaminating ground water. These sources do not only include the placement of waste, however. I think EPA has established that approximately two-thirds of the ground water contamination results from the placement of materials that are not considered

waste related or waste disposal, things such as placing pesticides on crop lands, oil and deicing chemicals placed on roads, leaking underground storage tanks, and pipelines, and the like.

There are, however, about 1,400 hazardous waste disposal facilities that are regulated as land disposal facilities under RCRA, under interim status, of which about 70 are commercial sites that accept hazardous waste from other people for disposal. Our members operate about 40 of the 70 sites that are regulated under interim standards under RCRA.

Currently EPA has two ground water protection programs. The one you heard about today is the one that is embodied in the ground water strategy prepared last year. Unfortunately, that is not a regulatory program. It does not have regulatory impact as was described this morning. But that program is the only Federal ground water protection program applicable to the great majority of the potential ground water contamination sources.

I want to focus this morning on EPA's other ground water protection program, that which does apply to the hazardous waste disposal facilities that we hear so much about. EPA's hazardous waste disposal ground water protection program has, itself, two basic parts. The first is a series of measures that are actually designed to protect ground water, measures such as the installation of double liners, and leachate collection systems, limitations on what wastes can be placed in land disposal facilities, and particular measures to close a facility so that after closure it will exclude precipitation from entering the disposal facility. There are a number of other elements to that program.

I can assure you that our members support these requirements and they comply with them. It is the second part of EPA's program, the monitoring of water around hazardous waste facilities that is of greater concern to us.

This program is being implemented currently by means of draft guidance documents that have never been circulated, except to State and regional regulators, and have never been released or even seen by the regulated community.

We support a ground water monitoring program for hazardous waste facilities, but not the program that currently EPA is implementing through its draft guidance. Currently, our members are sampling more than 1,500 monitoring wells at their 40 facilities, and by the time a critical deadline arrives in November, they will be monitoring about 1,850 wells. On the average, there are 46 wells per site, and at some sites, the number of monitoring wells is in the hundreds. Every facility operated by our members has at least the 4 wells, that is the regulatory minimum, and all but 5 facilities have at least 10 monitoring wells.

The goal of EPA's compliance monitoring program is to assure that the leakage of hazardous constituents in the ground water does not exceed acceptable levels. This is a reasonable goal and one that we support. But this goal was changed considerably when it was translated into monitoring hardware and action.

In the draft guidance, we find statements to the effect that there must be enough wells at the right location to immediately determine contaminant leakage. Wells must be placed so that all pathways of contamination are monitored. Wells must be placed closely

enough to ensure with complete certainty that the ground water monitoring system will detect leaks.

The ambient monitoring system has thus become a leak detection system, and a nonsensical leak detection system at that.

Our members tell us that in order to comply with the draft guidance, they would have to increase the number of monitoring wells at the 40 facilities from 1,850 to approximately 7,200 by November. The average monitoring well costs $15,000 to install, and a single analysis for the constituents of the appendix A list costs in excess of $3,000.

If the draft guidance were applied, our industry is facing additional capital costs beyond those already committed of more than $80 million and annual analytical expenses of more than $40 million. If we extrapolate the cost to the entire RCRA regulated community, including onsite facilities—and we certainly hope that EPA will apply the same rules to onsite facilities as they do to offsite—we are estimating that there will be somewhere around 90,000 to 100,000 monitoring wells installed at a capital cost of between $1.2 and $1.5 billion, and the annual costs for analysis will be approximately half a billion dollars.

This program has the potential to produce 60 million data points annually which must be logged, evaluated, and analyzed if they are going to be of any use. In short, the monitoring program has gone a bit overboard.

I will skip part of the testimony and go essentially to the bottom line.

I want to describe one of the real flaws of the program, which stems from the choice of chemicals which the agency is proposing to be measured. In particular, the draft guidance reflects EPA's apparent belief that it is important to establish what are called concentration limits for each of the appendix A constituents in the EPA RCRA regulations. However, there does not exist a framework for understanding the significance of each of these chemicals on that list.

The question is: What is the limit? What is the problem? In the interpretation of the results of ground water monitoring, what are the acceptable levels of contaminant concentrations in ground water that are not to be exceeded around hazardous waste disposal facilities?

For a mere handful of chemicals, less than 20, there are established interim primary drinking water standards. For the vast bulk of the 350 substances comprising EPA's shopping list, the maximum concentration is the background level of the constituent in ground water. Since most of these chemicals do not occur naturally in ground water, the background level is zero, and thus the acceptable level itself is zero.

For most of those constituents, the actual acceptable limit is, in fact, the analytical detection limit. If it can be detected, it exceeds background and, therefore, it is not acceptable.

To further confound the situation, the methods of analytical chemistry are being improved continually and the levels of detection are much lower today than they were only a few years ago. Thus, we have the situation where the acceptable limits are being

determined by the analytical chemist, the better he gets, the tighter the regulations.

This speaks, incidentally, to the problem of the nondegradation philosophy. If nondegradation is taken literally, this means that no increase in contamination can be permitted in ground water. This, obviously, would impact much more than just waste disposal, it would impact all of the sources that we now have.

Nondegradation is a good goal, but its implementation has to be dealt with very, very carefully to avoid having to create a whole host of exceptions.

Senator DURENBERGER. Are you near to conclusion?

Mr. JOHNSON. That is it.

Senator DURENBERGER. Ms. Smith.

STATEMENT OF VELMA SMITH, DIRECTOR, GROUND WATER PROTECTION PROJECT, ENVIRONMENTAL POLICY INSTITUTE

Ms. SMITH. Thank you, Mr. Chairman.

I appreciate this opportunity to testify on behalf of the Environmental Policy Institute and the Natural Resources Defense Council.

To begin with, I will take a tiny bit of the 5 minutes on a topic related to today's hearing. It has been brought up a number of times.

Both EPI and NRDC would like to thank you personally, and other members of this committee who worked so hard for passage of a strengthened Safe Drinking Water Act. The provisions regarding public water supply regulations in the version of your bill, which passed the Senate, show a strong commitment to public health. We commend you for that commitment, and we urge you to hold firm on important protections when you conference with the House.

Although the House-passed version of the act is somewhat more aggressive on ground water protection than the Senate bill, we are hopeful that the Senate will catch up quickly as you move through this series of hearings.

Today, we are prepared to offer a few alternative ideas for developing a national ground water policy, and we are committed to working with you to flesh out some of these concepts into working proposals. With the help of citizens across the country, both local and State groups, we are trying to assemble a comprehensive citizen strategy that will be available to you later this summer.

Our comments today relate specifically to the EPA ground water protection strategy.

To summarize very briefly, EPI and NRDC find the EPA strategy short on action, overly reliant on study, and premised on faulty assumptions. There are two major assumptions inherent in the EPA approach which cause us trouble and which, apparently, also cause some of the questioners some trouble this morning.

First, EPA assumes that the Federal Government should defer to the States on all points of ground water protection. We believe, to the contrary, that the Federal Government should be the leader in ground water protection. As a nation, we have come to accept the need for Federal action in many other areas of resource protection,

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and the same arguments which would apply to the protection of surface streams and air should also apply to ground water, the source of drinking water for half of the Nation's population.

Mr. Chairman, you and earlier witnesses have posed these arguments well, and we will not belabor them now.

The second faulty assumption that skews this EPA strategy is the assumption that we can do no better than to continue the contamination of certain ground water resources. With a questionable three-tier classification approach serving as the entire policy frame-work for EPA's ground water management efforts, this strategy adopts, perhaps between the lines, a goal of selective contamination.

With a classification scheme that may, in fact, loosen protections in certain areas, EPA would justify turning renewable resources into nonrenewable and unmanageable, in our view, waste repositories.

The best use of ground water, in our view, is not as a sink for chemical residues, nor is the best use of toxic materials as an additive to ground water. Rather than deny to future generations the use of water resources, we would ask today's generation to use toxic chemicals more judiciously.

When we established programs to protect air and surface water, we thought only of how to keep those chemicals out of those particular media. As you pointed out earlier, Mr. Chairman, our vision was too narrow for the real scope of the problem, and we ignored for the most part releases to ground water.

Now if we are actually going to solve this ground water crisis, we believe that we must try to take that broader view. We must scrutinize and improve our controls on sources, ranging from septic tanks to oil drilling and waste disposal, and we must use all the tools available—research, education, regulation, and incentives—to promote a more conservative use of chemicals and to develop a chemically tight society.

In addition to waste reduction, we urge a program which would result in product substitution, product reformulation, and process engineering changes to reduce pollution volumes and chemical usage in general.

I think that the question that Senator Burdick asked earlier about pesticides points to the need to go in that direction in terms of reformulation and priorities for research.

Any hint of such a vision, in our view, is lacking from EPA's strategy, and I think, in answer to some earlier questions on research and development, I didn't hear EPA talking about research and development that was focused primarily on prevention as opposed to what to do once the contaminant gets into ground water. And that concerns us a great deal.

Indeed, EPA seems to feel that the most they can do is offer some continuation of the status quo with a dose of in-house coordination. We believe that they have actually underestimated their own abilities.

We urge you, Mr. Chairman, to respond to this strategy with an articulation of a national goal to protect and enhance ground water resources, in keeping with resource protection goals in other laws. We believe that our goal must be one of no releases, either deliber-

ate or inadvertent, that would adversely affect the resource, truly not immediately achievable, but certainly worth striving for.

We then hope that the Congress will assure that the Federal Government takes a leadership role in addressing ground water problems. The States and the Federal Government must be partners in coping with diverse threats, but the Federal Government is needed to provide direction, technical assistance, research, and, in some instances, a regulatory framework and bottom line.

We believe that a Federal role is necessary to assure that our programs take a long-term view, and that citizens across the country find consistent and adequate safeguards for ground water.

In trying to conserve time here, Mr. Chairman, I have jumped around in my testimony, and I found that I neglected to say that there are areas in which EPA must be complimented. It is truly a difficult area they have tried to grapple with. The Office of Ground Water Protection, working on a limited budget, is already becoming an invaluable information source. I have had the opportunity to meet with many of the regional people that Marian has assembled, and I really feel that they are very knowledgeable and committed people. We look forward to working with them.

Again, I thank you for the opportunity, and I will be glad to answer questions.

Senator DURENBERGER. Thank you.

Mr. MASLYN.

STATEMENT OF MARK MASLYN, ASSISTANT DIRECTOR, NATIONAL AFFAIRS DIVISION, AMERICAN FARM BUREAU

Mr. MASLYN. On behalf of the American Farm Bureau, Senator, I want to thank you for the opportunity to be here today. From an agricultural and rural perspective, ground water is a vital natural resource and its potential contamination poses very serious and unique problems. To illustrate this, we need only point out that 68 percent of the nation's total ground water use is for cropland irrigation. 90 percent of our rural population relies on ground water as a source of drinking water. Complicating this situation is the fact that agricultural pesticides, fertilizers, and other farming practices have been cited as sources or causes of ground water contamination.

The farm community is faced with an obvious dilemma between the need to ensure that millions of wells in our rural areas are a safe source of drinking water, and a recognition that it may all be irrelevant if the means to achieve that end make farming an impractical venture.

We have reviewed the EPA ground water strategy, and believe that it provides a good framework for effective action on this important issue. The strategy will establish EPA as the focal point and coordinator of Federal ground water activities, while providing the States with much needed information and technical support. Equally as important, the strategy makes clear the role of the States and local governments as the principal architects, implementers, and managers of ground water protection activities. This is a fundamentally important point due to the localized site specific, soil specific nature of the problem.

We support many of the efforts being proposed by EPA to protect ground water from pesticide and nitrate contamination. Specifically, we support requiring manufacturers to provide data on leaching potential as part of the registration and re-registration process. The use of computor modeling techniques will be helpful in evaluating the likelihood of pesticide migration.

EPA must do more to evaluate the potential health effects of pesticide contamination in ground water. Our ability to detect minute traces of contaminants has far exceeded our ability to interpret exactly what, if any, health effects they may have. The lack of sound reliable information has led to hysterical and knee-jerk reactions on the part of many State and local officials when these contaminants are found. The result is that action levels and health advisories are being set by State and local officials in a highly charged political environment, rather than a scientific one.

A primary concern of Farm Bureau, with any ground water legislation, is that of retroactive liability. We do not condone the deliberate and unlawful misuse of pesticides, and believe that current statutes are sufficiently armed to deal with such violations. The vast majority of farmers, however, are conscientious and careful about the proper handling, application, and disposal of pesticides. Nonetheless, recent incidents of ground water contamination have left good farmers liable for potable water requirements and clean-up costs. Our statutes needs to recognize the plight of the conscientious producer who follows federally approved label instructions. We recommend that compliance with pesticide label instructions should absolve farmers from liability claims of environmental pollution.

Any discussion of ground water contamination must also consider the link between water quality and water quantity from agriculture's perspective. The withdrawal of irrigation water from an aquifer may lead to salt water intrusion, a higher concentration of contaminants, or induce recharge of the aquifer by contaminated surface waters. In addition to being protected from liability for what is a normal and routine activity, protection of water rights is essential for continued agricultural production.

The use of ground water classification is preferable to a policy of nondegradation and probably the most appropriate approach for agriculture. Nevertheless, the underlying objective is obviously to restrict or limit certain land use practices according to the ground water class. We believe that proposals must be flexible and take into account regional, topographic, geographic, and demographic differencese State and local governments are, by their proximity, best suited to make these decisions.

The EPA also needs to recognize and resolve what appear to be potential conflicts between this strategy and other EPA priorities. For example, private sector efforts to curb farmland runoff and nonpoint source pollution have led to the development of many new technologies in agriculture over the past decade, including the use of best management practices in many farming operations. It has long been recognized that one of the negatives associated with the use of some agricultural nonpoint source control practices has been the potential for increased migration of pesticides and nitrates into ground water. EPA needs to clarify their objectives with

regard to these two very important but potentially conflicting priorities.

We restate our support for the goals and objectives of the ground water strategy. With certain exceptions, we think it is an effective blueprint for addressing the ground water contamination problem and focusing public attention on this emerging issue.

We share your concern that ground water quality and the prevention of ground water contamination is an issue that must be addressed. We commend you for holding these hearings and we look forward to working with you in the future as this process continues.

Thank you very much.

Senator DURENBERGER. Thank you very much.

Ms. BOCHERT.

STATEMENT OF LINDA BOCHERT, EXECUTIVE ASSISTANT TO THE SECRETARY, WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Ms. BOCHERT. Good morning.

I am Linda Bochert. On behalf of the Wisconsin Department of Natural Resources, thank you for the opportunity to testify today.

Wisconsin is heavily dependent upon ground water. One hundred percent of our rural and suburban residents, and all but 19 of our 550 municipal water supplies use ground water for their drinking water. All of our aquifers are presently used as drinking water sources.

In 1984, Wisconsin enacted comprehensive State ground water legislation. The cornerstone of our legislation is numerical ground water quality standards. We use a unique two-tiered approach. Two numbers are set for each substance. The upper limit, called the enforcement standard, defines the public health and welfare protection, and it is similar to a primary or secondary drinking water standard. Enforcement standards are based on Federal numbers which are defined as EPA maximum contaminant levels, or EPA drinking water advisory levels.

We utilize Federal numbers because they represent the best and most widely accepted information available. The entire premise of our law is to assure that the enforcement standards, based on the Federal numbers, are never reached. That is done through use of the second, or lower limit, called the preventive action limit, which is established as a designated fraction of the enforcement standard.

To date, we have adopted enforcement standards and preventive action limits for some 49 substances.

Our legislation embodies the four key principles of Wisconsin's ground water management approach. First, uniform protection for all aquifers. The standards apply uniformly to all Wisconsin ground waters. No aquifers are written off, since they are all being used as drinking water sources.

Second, emphasis on prevention. We emphasize stringent design and siting requirements. Preventive action limits assure the continued use of stringent designs to prevent contamination. This emphasis on prevention and minimizing impacts on ground water is far

more efficient and technically feasible than relying solely on expensive remedial efforts.

Third, limited degradation. Our standards recognize that absolute nondegradation, while desirable, is simply not achievable. The standards provide the means to measure which impacts are allowable and, if necessary, the degree of cleanup which will be required.

Fourth, a multi-agency approach. In Wisconsin, many State agencies have responsibilities related to protection of ground water, but only one agency, DNR, sets the ground water standards. We coordinate the activities of all agencies by requiring that they regulate so as to comply with the State's uniform ground water quality standards.

With these points in mind, we have five recommendations about the Federal role and EPA's strategy.

First, Federal efforts should reinforce the State's lead role. States are best equipped to carry out regulatory programs for ground water management. Uniform national management of ground water is neither needed nor desirable. We support EPA's recognition of the lead role of the States.

Second, Federal efforts must be increased in the crucial development of health advisory levels and toxicological information for ground water contaminants. A multitude of contaminants are being found and health related judgments are necessary. States are adopting ground water standards, but they should not be required to individually interpret research data. That is the Federal responsibility. As I described earlier, in Wisconsin, we must have these Federal numbers in order to best implement our program.

Third, aquifer classification systems should be optional with the States. We looked at aquifer classification, our legislature looked at aquifer classification, and we decided that it is not appropriate for us. We have not yet found a landowner who wants the aquifer under his residence to be classified as anything less than drinking water. We have a strong and successful program based on numerical standards applied uniformly to all aquifers. We do not want any sort of an aquifer classification scheme that is inconsistent with our approach, imposed upon our State under the guise of consistency among EPA programs.

Fourth, EPA should initiate a national ground water monitoring and research program cooperatively with the States. We need an EPA coordinated effort to identify and assess ground water problems of national significance, to collect and manage available data, and to develop monitoring guidelines and best management practices.

Finally, fifth, new Federal ground water legislation is needed. The legislation should establish a deadline for States to develop an EPA approved ground water program. The legislation should emphasize prevention. The legislation should enable States to develop ground water standards no less stringent than the Federal health advisory levels. The legislation should provide increased Federal funding to strengthen State ground water programs, both in the development and maintenance phase of those programs.

We look forward to working with you and sharing the Wisconsin experience in developing Federal legislation.

Thank you very much.

Senator DURENBERGER. Thank you, Ms. Bochert.

You describe Wisconsin's program as a limited nondegradation program, and I think it has been described by others as the only State program that has a nondegradation philosophy attached to it.

Would you advocate adoption of a nondegradation goal on a national basis?

Ms. BOCHERT. As a goal, yes, Senator, I think that it is an appropriate and laudable goal to attempt to control as much as possible the sorts of insults that surface activities can bring to the ground water. But we also must recognize that surface activities are going to have effects on ground water, and that is why the Wisconsin approach is to place so much emphasis on prevention and controlling ground water impacts or ground water damage by emphasizing control at the source.

Senator DURENBERGER. Let me also ask you a couple of questions, about ground water standards, since Wisconsin's program is based on them. I am not sure where the place for standards is in the Federal program, because some people suggest that they can become more pollution standards than protection standards.

The first question is, How are standards used to prevent contamination rather than allowing a specified amount of pollution in an area?

Ms. BOCHERT. We do that through what I have referred to as the preventive action limit. If I can digress to a little bit of technical information, this is set as a percentage of the enforcement standard or the drinking water standard, if you will. The focus of the preventive action limit is twofold. First, it has what we call its preventive function. The way that is handled is that, let's say, a landfill, for example, must be designed in order to assure that it will not have an effect on the ground water which would exceed the preventive action limit.

So it does recognize that there may be an impact, and what it does is to describe the ceiling, or the maximum level that that impact may have. That is what we deem an acceptable impact, if you will. So the prevention is utilized through the very strict siting and design requirements which incorporate compliance with the preventive action limits and numerical standards.

We also use those prevention action limits which are a fraction of the enforcement standards, as I said, to determine what level of cleanup would be required. So if we do have a contamination incident, it is not acceptable to us to clean it up only to the level at which the water would then be returned to an acceptable drinking water supply, it must be restored as close as possible to the preventive action limit, which, again, we have described as an acceptable deviation from background.

Senator DURENBERGER. A second question. Are standards a necessary element of a quality protection program such as you have in Wisconsin?

Ms. BOCHERT. Wisconsin used to employ an approach which we called, the no detrimental effect philosophy, or the nondegradation philosophy. What we found, frankly, was that from individual management program to program within the agency, the definition of what was a detrimental or a nondetrimental effect differed from

reviewing engineer to reviewing engineer, because it was not quantified. It was much more of a subjective judgment.

So we determined, after years of what I think was pretty good ground water protection in Wisconsin, but still confronting some significant problems, that that subjective element was really no longer going to be satisfactory for us, and that we needed to go to a quantification approach. That is the way we have described these numerical ground water standards.

Senator DURENBERGER. Finally, explain to me how a comprehensive program can be based on 49 standards, which I think is the figure that we took out of your testimony, in view of all the previous discussion on the subcommittee about the difficulties with monitoring and the much greater number of potentially harmful chemicals that we have standards for.

Ms. BOCHERT. What I have been able to describe to you this morning is only a portion of the State ground water legislation. We also have a significant monitoring ingredient which addresses itself to existing sites like landfills, areas which we believe, based on their sorts of land uses, are vulnerable to future problems. So we have a very comprehensive State monitoring program which is a component of the legislation.

To date, we have adopted enforcement and preventive action limits for 49 substances, as I said. We expect to be adopting enforcement standards and preventive action limits for more substances as we are able to do so, but that is really where the Federal role becomes increasingly important to us, because the information we need in order to do that is the Federal health advisory information which we feel the Federal Government is in the best position to provide to the States.

Our legislation does provide, though, that in the absence of that information at the Federal level, we have a methodology available to us at the State level to attempt to derive those numbers ourselves. We will do that, but frankly we would prefer to have the Federal expertise available to us.

Senator DURENBERGER. Mr. Maslyn, let me ask you a couple of questions about pesticides. You talked about the fact that good farmers who comply with label instructions should not be liable for the problems of potable water requirements and the clean up costs.

Do you believe that existing pesticides can be used in a manner that they will not contaminate ground water? What is your feeling about that?

Mr. MASLYN. It all depends, of course, on the pesticide. Certainly, as we learn more about the ground water problems, there are things that we can do. As we learn more about the nature of the particular pesticides, there are things that we can probably minimize potential contamination, such as EPA is proposing by restricting use under certain soil types, and certain hydrological conditions. Selected restriction is much preferable to a total ban or cancellation of a pesticide product.

Yes, there are things that can be done. Not too long ago, we were asking the same questions about surface water in the Clean Water Act, and we have found that there are technologies being developed and being put in place that would reduce surface water contamination. I am optimistic that we can do the same thing with ground

water. Those technologies and practices have to be thought through and explored.

Senator DURENBERGER. Watermelon can't be eat in southern California now. As we find drinking water being poisoned, we then go back to somebody and say, "Don't do it", or is it possible that someone ought to be held liable in advance so that more research into contaminant possibilities goes into pesticides just to protect the farmer?

Mr. MASLYN. Senator, I think if we look at one example in the State of Connecticut, there are a number of farmers in the Connecticut Valley who grew tobacco and used ethylene dibromide for years and years as a soil fumigant. No one suspected that EDB would end up in the ground water. It was not a concern at the time of registration. That has all changed. We should look at those things. Nonetheless, those producers used that chemical in compliance with the label in full faith of what that label said, and that the Government stood behind that label, by listing under what conditions it should should not be used, and that was appropriate.

As conditions change, as the technology to detect contamination improves, we feel that there is a need to protect the conscientious producer.

Senator DURENBERGER. On the label issue, you take another position also, not necessarily contradictory to that, but in your testimony, you say:

> We are concerned about the use of labeling to restrict the use of pesticides in certain geographic areas because of soil type, hydrogeology and ground water use. While this approach is preferable to the total cancellation of a particular product, we believe very strongly that abatement of the contamination should not be the sole criteria for action and consideration be given to the economic effects of that decision upon local agricultural production.

How do we implement a recommendation like that? Who makes those economic decisions when we are also talking about public health, when we are talking about the plume that this chemical may have in an aquifer of some kind?

Mr. MASLYN. Obviously, I think EPA is doing that right now. At least in the past year or so, they have increasingly brought into question, on the cancellation of pesticides, its use in a particular geographic area with particular hydrogeological characteristics. I guess what we are asking is that when they move to take action against a chemical, a tool that farmers are utilizing, that they consider the potential impact of that cancellation or suspension on the local agricultural community.

At one of your earlier hearings, you had the County Executive of Suffolk County, New York, here. Suffolk County, believe it or not, is the largest agricultural county in the State of New York. It also has some very unique ground water problems. With the restriction of aldicarb, the potato industry, for example, on Long Island has suffered some very serious economic problems. The number of producers has declined steadily in the last 10 years. I am not saying that this is the sole cause of that, but it is one of the factors, the frustration on the part of producers of not being able to have an effective tool to save their investment. It is a factor that we feel should be brought into consideration in this process.

Senator DURENBERGER. Would you like to follow up on that?

Ms. KANY. Yes, Senator Durenberger, I feel the need to speak up.

Senator DURENBERGER. On behalf of potatoes?

Ms. KANY. That is right.

Actually, I was thinking just how important it is that the Federal Government help provide some of that uniform health advisory effort and the technical assistance. I was thinking about potatoes.

For instance, so far as I know, no one has tested potatoes to find out if there is temik in them. I think that we must err on the side of caution. We simply know too little about too much. I do think that we need to take immediate action for prevention. We can refine things later. I am thinking in terms of underground tanks. I say please act now and refine later. We need research in pesticides. We use them all the time in my State of Maine. We use them on our forests. We use them on utility right-of-ways. We use them in our agricultural fields. We use hazardous substances all the time.

Another area a year ago when we were just beginning to inventory our hazardous air pollutants we found that we simply didn't have the technical assistance available to us in the State of Maine. Other States had exactly the same problem—they simply didn't have the expertise to deal with the hazardous air pollutants. We are just beginning to learn about acid rain, and that is just one area involving hazardous air pollutants.

We know little about hazardous air pollutants. We know not what they are in most of the country. We have no regulatory scheme for them generally. The last I knew there were only four hazardous air pollutants that EPA was regulating, and hazardous air poilutants end up making their way down into that ground water.

We really desperately need technical assistance. I just really felt the need to speak up after hearing your questioning and after having heard from the person from the State of Wisconsin.

Senator DURENBERGER. I think that all of you know that the purpose of this series of hearings is to lead to drafting a bill, hopefully later this summer.

One of the questions that I asked Henry Longest dealt with what you have just been talking about, that is the information gaps, and the research and development needs.

It would be very helpful to the subcommittee if each of you went back and expanded on whatever testimony you may already have given us on the research and development needs for ground water. If you broke them down into two categories, in terms of the satisfaction of the needs. One, those that in your opinion can most easily be done, can most readily be done nationally, in other words, they ought to be worked into the EPA R&D effort so that that is the most efficient way, let's say, to go about developing the information; and/or most appropriate to what you see to be their particular responsibility in this system. The other would be to identify other areas of research. I wouldn't want you to go too far on that one. You can identify the nontoxic pesticide as a need, which we talked about here earlier, if you want to, but I am really thinking more in terms of the basic research and development—I guess that is a legitimate one since so much of the potential pollution comes from that area.

If you would put them in those two categories for us, it will be helpful since you do come from different elements of the system. It will be very helpful to us in structuring an appropriate legislative response.

With that, I thank you all very much for your testimony, and everyone who was here today. The hearing is adjourned.

[Whereupon, at 12:04 p.m., the subcommittee adjourned.]

STATEMENT OF
HENRY L. LONGEST II
ACTING ASSISTANT ADMINISTRATOR FOR WATER
U. S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON TOXIC SUBSTANCES AND ENVIRONMENTAL OVERSIGHT
UNITED STATES SENATE
JULY 16, 1985

Good morning, Mr. Chairman and members of the Subcommittee. I am Henry L. Longest, II, Acting Assistant Administrator for Water of the U.S. Environmental Protection Agency. With me today is Ms. Marian Mlay, Director of the Office of Ground-Water Protection. We are pleased to report to you that the EPA has taken the initiative in shaping a ground-water protection policy. The Ground-Water Protection Strategy, issued in August 1984, has served the purpose of providing a framework for a wide range of new, as well as existing activities by a variety of programs in the Agency. We appreciate this opportunity to discuss the status of its implementation.

The Strategy reflects an Agency-wide effort to ensure the protection of this important resource. In its development, we took a number of factors into consideration. First, based on law and tradition, States have the primary responsibility for the protection of ground water. Second, we recognized that a broad range of federal statutes exist which relate to the protection of this resource and provide considerable support to State efforts in areas of greatest risk and burden. Third, science and technology in this area are rapidly expanding. The available tools for monitoring ground-water quality and

controlling and cleaning up contamination are often expensive and not fully effective or predictive. Fourth, the risks to public health posed by many chemicals are not fully understood due to the scientific uncertainties inherent in evaluating toxicological evidence of cancer and other complex health consequences such as mutagenicity and other chronic effects.

Finally, we recognized that while we have not yet fully documented the extent or consequences of ground-water contamination, the problem is real and substantial. Ground-water contamination is the result of many years of activity carried out without regard to the effect on our ground-water supplies. Such activity has to be curbed and appropriate responses taken to protect public health and the environment. Taking these factors into consideration, we concluded that prevention is the key and focused the Strategy in this direction.

SUMMARY OF STRATEGY OBJECTIVES

The Strategy represents a full recognition of EPA's role in ground-water protection and a substantial redirection of our work to protect this valuable resource. The Strategy identifies four goals to be achieved. They are:

- Creating consistent EPA program policy which requires consideration of the value of ground water and its vulnerability to contamination in the design and implementation of environmental programs; and

- Giving greater emphasis to sources of contamination that appear to be of particular national concern, such as pesticides and leaking underground storage tanks, and taking steps to enhance protection efforts;
- Coordinating the development and implementation of EPA policies with EPA headquarters and the Regional Offices, other Federal agencies, and with the many constituencies interested in these issues.
- Strengthening the capacity of State government to manage and protect ground-water quality;

The implementation of the Strategy is well underway. To provide a focus for activities related to ground-water protection, EPA created the Office of Ground-Water Protection in EPA's Office of Water in April, 1984. It is now staffed and operating. Subsequently, counterpart offices have been established in each of our ten regions.

The Ground-Water Office has a cross program purpose. It is responsible for working with headquarters and regional programs in developing consistent ground-water policies for all offices and for providing a focus within EPA for ground-water protection concerns. For example, the Office works with EPA program offices to coordinate and strengthen the Agency's efforts to protect ground water. An example is the joint development of a Pesticides in Ground-Water Strategy with the Office of Pesticide Programs. Others are a Toxic Ground-Water Strategy with the Office of Toxic Substances and the development of resource needs for a Ground-Water

Information Management Program with the Office of Administration. We are pleased at the extent to which these Agency-wide efforts are progressing and the interest and support given by our program offices to the ground-water protection strategy.

I would like to take this opportunity to highlight the status of a number of activities underway to implement the strategy.

ACCOMPLISHMENTS AND COORDINATING ACTIVITIES

1. Creating a Consistent EPA Program Policy

One of the major concerns addressed in the Strategy is the need to achieve greater consistency among the many EPA programs related to the protection of ground water and to take the value and relative vulnerability of the ground-water resource into account in decisionmaking. These needs required the development of a consistent policy framework for EPA decisionmaking on ground-water protection and cleanup. In the past the Agency has focused on protecting ground water from individual polluting activities. This focus failed to provide consistent levels of protection from each program. That is, some programs tended to factor-in ground water considerations to a greater extent than others. State and industry were faced with EPA programs that overprotected in some instances and underprotected in others.

It became clear that the Agency must direct its program activities toward a consistent set of protection goals. While the broad goal of EPA's ground-water protection efforts is to protect human health and the environment, the Agency needed a policy or operational tool that would guide ground-water decisions

so they would reflect clear priorities and directions. EPA adopted a policy for the Ground-Water Protection Strategy which will minimize risks to human health and the environment while realistically protecting the resource. This policy provides base level protection for most ground water. For these ground waters EPA would then apply our current protection approaches, gearing our efforts so that the highest beneficial use, drinking water, would be protected. The Strategy recognizes however that some ground waters deserve greater protection than others due to their particular uses, relative value to society, and geohydrologic vulnerability. For these, protection and clean up will be the most stringent. Other ground-waters with little value for water supply or non-waste disposal purposes will not require the same degree of protection.

This approach has been recognized by many States as a logical and protective way of managing ground-water and was widely supported by major national constituency groups when the Strategy was made available for comment.

This approach is now being developed into a three tiered classification system for use by EPA programs. Class I is reserved for "special" ground waters. Simply stated, these are ground waters which are highly vulnerable to contamination due to their hydrogeologic characteristics and critically valuable to society in that they are characterized by and may possess either of two critical features:

- they are irreplaceable sources currently used as drinking water for substantial numbers of people;

- they supply base flow to ecologically vital areas which if polluted, would destroy unique habitats.

In a sense, these ground waters are of unusually high value to society and the environment and their contamination poses the highest level of risk. They would, therefore, require especially tight controls for protection. Class I represents a small number of total ground waters where consequences have been and would be the most serious.

Class II covers the vast majority of ground-water settings. This class includes both current and potential sources of drinking water and is broad enough to include other beneficial uses such as irrigation, livestock watering, and most baseflow to wetlands and streams. The bulk of EPA's existing regulatory strategies are already designed for these Class II settings and constitute "base level" protection.

The remaining class, Class III, is (like Class I) another geographically restricted category. These ground waters are not currently used as drinking water supplies and have few, if any, other beneficial uses apart from waste disposal. In addition, they are relatively "isolated" from ground waters or surface waters with higher beneficial uses. These waters may, in their national state, be of poor quality or have undergone broad-scale degradation from human activity. Management approaches for these ground waters reflect the fact that cleaning up to drinking water quality is infeasible or exceedingly unlikely, and the contamination will not affect human health or the environment.

Class III determination will be restricted to relatively few locations where the hydrogeology of the area has been assessed in detail.

It should be emphasized that EPA will use the classification process primarily as a tool in ground-water protection and site-by-site decisionmaking. For example, EPA will not classify broad segments of aquifers in advance of a given decision. Classification is clearly understood as the role of State government.

The classification system is designed to provide better ground-water protection by using meaningful criteria to make program decisions. For example, ultimately each program in EPA which reviews a permit or a clean-up action will have established protection or cleanup approaches for each class of ground water.

The Office of Ground-Water Protection is already working with EPA program offices in defining appropriate protection and cleanup strategies for different classes of ground water. The Office is helping to modify Agency program guidance to incorporate both the classification system and appropriate management strategies. Further, these will be reflected in future regulations under programs such as RCRA, CERCLA and the Underground Injection Control Program.

As the classification system becomes incorporated into EPA programs, however, EPA will recognize the use of State classification systems where they are at least as stringent as the EPA system. Our delegation decisions will be as flexible as

permitted by the laws and regulations which the classification system will affect and will concentrate on the outcome of the classification system rather than similarities in process, numbers of classes or other non-substantive factors.

The Office of Ground-Water Protection is developing these guidelines through a workgroup composed of representatives from seven major EPA program offices in headquarters, four EPA Regions, the U.S. Geological Survey, three State governments, and one local government. Draft guidelines will be available for public comments in the Federal Register in late November 1985 and the final guidelines will be released in Spring 1986.

2. Greater Emphasis on Sources of Contamination of Particular National Concern

Another major goal of the Ground-Water Protection Strategy is to help focus Agency efforts on several particular sources of ground-water contamination needing greater emphasis such as, pesticides, underground storage tanks and landfills. I would like to discuss each of these problem areas.

Pesticides

Pesticides have been found in ground water in at least 23 States; contamination by 16 different pesticides can be attributed to normal agricultural practices; as many as 50 different pesticides have been found in ground water from all sources including disposal and spills.

During the past year, EPA has intensified its efforts to identify pesticides which are likely to leach into ground water

and to place additional controls on those which are found to present a significant risk to human health and the environment.

By the end of this year, EPA will have received certain key environmental fate information on all pesticides the Agency believes are the most likely to leach into ground water. Such information has been routinely required and evaluated for all new pesticides. In late 1984, EPA issued an order requiring manufacturers of other pesticides to provide this information on an accelerated basis so that a complete data base will be available for evaluation. A ground water team recently established in the Office of Pesticide Programs will apply this information along with hydrogeologic data to assess the impact of certain pesticides on ground water, as well as assist States in various monitoring studies. EPA has already restricted the use, imposed additional monitoring requirements, or required special label statements on several pesticides found to pose a threat to ground water.

The Agency is designing a monitoring survey to provide a national picture of the extent of the presence of pesticides in drinking water drawn from ground water as well as the geological and use conditions that affect migration of pesticides into ground water. The survey will be jointly conducted by the Offices of Pesticide Programs and Drinking Water, and will serve to support future pesticide and drinking water regulatory activity. In conjunction with this study, the Pesticides and Drinking Water Offices are accelerating development of health

guidances that State and local officials can use in responding to contamination incidents.

Finally, the Administrator has created a work group, co-chaired by the Office of Pesticide Programs and the Office of Ground-Water Protection, to review EPA's overall efforts to prevent pesticide contamination of ground water, and EPA's responsibilities for remedial action if contamination occurs. This group will analyze, for example, the use of labeling for achieving geographic restrictions where certain pesticides are of particular concern. An Agency-wide strategy is under development which will encompass all EPA's authorities and programs to increase protection of ground water from pesticide contamination.

Underground Storage Tanks

Millions of underground tanks are used to store a wide variety of liquids, including gasoline, domestic fuels, hazardous and toxic chemicals, and wastes. Leaks from underground tanks can contaminate nearby soils, surface water, and ground water. This problem was highlighted in the Strategy and several specific steps were undertaken in the summer and fall of 1984 to address this issue.

The Office of Toxic Substances, in cooperation with the American Petroleum Institute and other trade associations, issued a Chemical Advisory which notified owners and operators of gasoline service stations of the problems associated with leakage from underground gasoline storage tanks and discussed how they can identify and resolve these problems. Such voluntary

actions should help to mitigate potential problems while control programs are being developed.

Also in response to the Strategy, the Offices of Toxic Substances and Solid Waste and Emergency Response have initiated a national survey to test a representative group of tanks to determine the extent and causes of leaks from tanks containing petroleum products. The Office of Research and Development expanded its research on the effectiveness of methods for detecting leaks, and methods to monitor leaked materials in ground water, to better understand the factors affecting tank life. These findings will be very useful to EPA for devising control programs as well as for estimating the costs of preventing and correcting leaks.

In response to the Hazardous and Solid Waste Amendments signed by the President on November 9, 1984, the Office of Solid Waste has begun a major program to develop standards addressing this important environmental issue. New standards for hazardous waste tanks were proposed on June 26, 1985 under Subtitle C. In response to Subtitle I, which addressed underground tanks containing products, rather than wastes (petroleum and CERCLA hazardous substances), the Agency has begun major regulatory options formation. In March, the Underground Tank Development Plan was released to the public. In it, the Agency committed itself to developing standards for this program that incorporate the Ground-Water Protection Strategy to the extent possible given the outcome of various environmental impact studies.

Toxic Substances

Toxic substances such as trichloroethelene (TCE) and other volatile organic chemicals are being found in increasing numbers of drinking water supplies. Volatile organic chemicals are occurring in greater concentrations in water supplies drawn from ground water resources than in those using surface water sources. The Office of Toxic Substances and the Office of Ground-Water Protection are working together to determine how the Toxic Substances Control Act (TSCA) may be used to provide information on ground-water contamination sources and to control situations posing significant health or environmental risks.

Technical Information Documents

To help address ground-water contamination problems which are within the province of State and local governments, the Ground Water Office is initiating a series of technical information documents. These documents will provide State and local officials advice on the stats-of-the-art in pollution control, including sample ordinances and technical manuals. The technical information documents will enable these officials to assess their own programs and take appropriate action. To develop the documents, EPA will bring together a group of technical, legal and management experts. A separate group will be formed for each subject to provide special expertise and insight into key issues and approaches. The final recommendations will then represent a consensus of the best available judgment. Outreach will be provided through major national organizations. The

first document will address one of the most ubiquitous ground-water contamination problems, septic systems.

3. Coordinating the Development and Implementation of Ground-Water Protection Policies

A major effort in achieving the objectives of the Strategy will be coordinating and implementing ground-water protection policies across program lines and with other Federal, State, and local agencies. The Office of Ground-Water Protection uses several mechanisms for carrying out this task.

One is in the area of ground water monitoring and information management which affects several programs in the agency, the States and other Federal agencies. The Office of Ground-Water Protection established a task group to develop a Ground-Water Monitoring Strategy which will articulate what information the Agency and States need for decisionmaking and how such information can best be collected and by whom. The group includes representatives from EPA headquarters, the Regional Offices, the U.S. Geological Survey, and three States. It helped frame the major issues addressed at a monitoring workshop in early April 1985. Fifty leaders from State and local governments, business and industry, and the environmental and academic communities provided a general consensus on objectives for monitoring ground-water and how Federal, State and local governments and the regulated community can work together to help realize these objectives. A proposed strategy should be completed this summer.

In the area of research, the Office of Ground Water Protection arranged for the EPA Science Advisory Board to establish a committee to assess EPA's ground-water research efforts and to recommend future research activities and areas of emphasis. Committee membership includes scientists, and engineers from academia, the private sector, as well as Federal and States. The committee has met five times and has just completed a draft report on its findings and recommendations.

A second mechanism that the Ground Water Office is using to develop and implement EPA ground water policy is the use of review and decision making committees. Principal among them is the Ground-Water Oversight Committee chaired by the Assistant Administrator for Water which provides policy oversight to strategy implementation. It includes the Assistant Administrators for Research and Development, Pesticides and Toxic Substances, and Solid Waste and Emergency Response, as well as the Regional Administrators from Regions I and VIII. Because these officials are the principal decision-makers at EPA on matters of ground-water protection, this committee provides the Office of Ground-Water Protection unique top management oversight to key ground-water issues.

Also at Headquarters there is the Ground-Water Steering Committee composed of all program office directors and representative Regional officials with ground-water responsibilities. It serves as the Office of Ground-Water Protection's primary group of contacts with EPA programs. It reviews and makes recommendations

on major policy initiatives related to the Strategy and the work of the office.

Each Region has created a ground-water coordinating committee. In most Regions it is chaired by the Water Division Director and includes Directors for Hazardous Waste and Environmental Services and other key Regional officials. The Regional Ground-Water Office provides staff support. The committee develops ground-water policies that support the Ground-Water Protection Strategy, oversees the implementation of those policies, and coordinates Regional activities on issues and problems of common concern.

A final set of coordination mechanisms relates to other Federal agencies. To assure good general communication, the Interagency Group on Ground Water has been established of representatives of the Federal Agencies with responsibilities related to protecting ground water. Chaired by the Assistant Administrator for Water, the group serves as a forum for exchanging information on ground-water issues and EPA's Strategy.

EPA is also negotiating specific efforts to be carried out with other agencies. For example, the Department of Interior and the EPA have concluded negotiations on a memorandum of understanding (MOU) covering the relative roles and responsibilities of the EPA and the U.S. Geological Survey in the areas of ground-water research and development, monitoring, and technical assistance. Through the MOU we expect to fully utilize and bring to bear the scientific capabilities of both organizations on the many areas where new knowledge is critically

needed. The MOU also covers EPA's participation with the Bureau of Reclamation in the implementation of the High Plains States Ground-Water Demonstration Program Act of 1983.

4. Strengthening State Programs

Strengthening State programs is the first goal cited in the Strategy. Many States are now developing innovative and sophisticated ground-water programs of their own. However, more can be done. This year EPA is awarding seven million dollars in grants to State agencies which will support the development and implementation of State ground-water strategies and programs and a similiar amount is available in FY 86. Most of the grants have already been awarded. They range from minimums of $50,000 for Territories to between $100,000 and $380,000 for States. With these funds States are developing and enhancing State ground-water management strategies, instituting monitoring programs, developing classification and data management systems; designing control programs, and conducting an assessment of pollution impacts on the resource. Regional ground-water offices are working closely with the States to assist them in these efforts.

A principal need for all States is a comprehensive management strategy based on established State goals for ground-water protection, a determination of the States' ground-water problems, the hydrogeologic setting in which those problems are occurring and the coordinated use of existing State institutions.

Through its $7 million ground water grant program and technical assistance efforts, EPA is encouraging and supporting

State Strategy development. We are enlisting the help of other Federal Agencies such as the USGS in providing hydrogeologic background information and technical assistance for the States.

To assist States that wish to develop programs for coordinated ground water protection, EPA is working to develop new knowledge about what arrangements have worked well in various States. For example, EPA has awarded a grant to the National Research Council (NRC) to evaluate ten State and local ground-water protection programs to determine the most workable approaches. The NRC has established a committee composed of 13 distinguished experts from the fields of public policy and science to carry out this evaluation.

In addition, States may need information to develop the component parts of the State strategy including monitoring, data reporting and control programns. As indicated before, we are enhancing our efforts to provide assistance to the States in each of these areas; for example, the ground-water monitoring strategy will identify special problem pesticides in ground water needing greater emphasis; the development of technical information documents will enable States to address problems that are within State and not EPA program jurisdiction. Further, general financial support to States has increased substantially and will continue to increase in FY 86 in support of State program efforts delegated by EPA.

Finally, a substantial area of State need is the development of new knowledge about ground-water quality, how chemicals move

underground, how they can be prevented from entering ground water and how they can be removed. EPA's Office of Research and Development has expanded its efforts in such areas as monitoring and detection methods, aquifer reclamation, source controls, technology transfer and quality assurance. The Office of Research and Development along with USGS and other agencies, is expanding its efforts in this direction and is working closely with States to assure that their special needs are addressed.

Another means of strengthening State and local efforts was to provide a continuing forum for EPA, State and local officials to share information on ground-water programs. The group is co-chaired by EPA and the National Governors' Association and consists of leaders from a dozen national organizations which represent State and local government. Its first meeting was held in March and the next is planned for September. Similar meetings are being held by the regions with leaders within their jurisdiction.

The Ground-Water Office also has underway a series of activities to exchange ideas with and help inform States of new, creative ways of managing ground-water protection programs. For example, the Ground Water Office is supporting a consortium of universities, headed by the University of Oklahoma, to conduct a series of symposia on public policy questions related to ground-water protection. One symposia was recently held in Denver and two additional symposia will be held this fall.

Several more are planned for the following year. Future topics may include such issues as the need for ground-water specialists over the foreseeable future. Additionally, the Office of Ground-Water Protection has issued a series of publications on State ground-water programs, including a two volume set summarizing current state ground-water programs and another describing State and Territorial ground-water classification programs.

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As you can see, the EPA has taken substantial steps toward implementing our Ground-Water Protection Strategy. As this work continues to intensify, the Agency is confident that our nation's valuable ground-water resource will receive the protection it so critically requires. Thank you for this opportunity to address the Committee and I would be happy to answer any questions you might have.

National Solid Wastes Management Association

1730 RHODE ISLAND AVENUE N.W. • TENTH FLOOR • WASHINGTON, D.C. 20036
TELEPHONE (202) 659-4613

EUGENE J. WINGERTER
EXECUTIVE DIRECTOR

TESTIMONY BEFORE THE

SENATE SUBCOMMITTEE ON TOXIC SUBSTANCES AND OVERSIGHT

ON

GROUNDWATER STRATEGY

Submitted By

Dr. Charles A. Johnson
National Solid Wastes Management Association

July 16, 1985

Thank you Mr. Chairman. I appreciate the opportunity to appear before you this morning. My name is Charles A. Johnson. I am the Technical Director of the National Solid Wastes Management Association, a trade association whose members provide services of treatment and disposal of all sorts of wastes both hazardous and non-hazardous. I have a Doctorate Degree in Chemical Engineering and I am also a registered Professional Engineer. My experience with waste treatment and resource recovery predates the enactment of the Resource Conservation and Recovery Act of 1976 (RCRA) by several years and I've been involved in the program to implement that law since its enactment.

I'm pleased to be able to discuss with you some issues related to groundwater protection and groundwater monitoring. These issues, while obviously important to our industry, are even more important to the well being of our nation's environment. Today I would like to make you aware of three points:

- How our industry relates to the problem of groundwater protection;
- How we are working to solve our part of it;
- How EPA is performing their responsibilities related to our industry.

It has been well established that whenever substances are placed on or in the ground, those substances have a potential for contaminating groundwater. Recently, EPA categorized the primary sources of groundwater contamination. According to the Agency's review, more than two-thirds of comes from sources totally unconnected with waste disposal. Those sources include application of pesticides and fertilizers to cropland, oils and de-icing chemicals placed on roads, leaking underground storage tanks and pipelines, salt intrusion resulting from draw down of groundwater by pumping and spills of chemicals. The remaining one-third of groundwater contamination comes from sources associated with various waste disposal practices. In descending numerical order, these include about twenty million septic systems for on-site disposal of waste waters, some one hundred eighty thousand surface impoundments, approximately ninety-three thousand waste disposal sites and about sixteen hundred potential Superfund sites of which approximately six hundred are now on the National Priority List awaiting clean-up under CERCLA. Finally, there are about fourteen hundred hazardous waste disposal facilities that are regulated as land disposal facilities under RCRA of which only about seventy are commercial sites that accept hazardous wastes from generators for ultimate disposal. Our members operate forty of the commercial hazardous waste disposal facilities that are subject to the groundwater protection program of RCRA.

My views may be of some interest not just because EPA's program affects the industry that I represent but more because I believe the

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experience with the hazardous wastes regulatory program suggests strongly that there is a need for an overall framework for groundwater protection. It is my understanding that one of the major purposes of this series of hearings is to assist the Congress in formulating such a framework.

Currently, EPA has two groundwater protection programs. The first and by far the most encompassing program is embodied in EPA's Groundwater Strategy prepared in August 1984. Unfortunately, that program might fairly be characterized as a non-program because its lack of regulatory teeth. That program is the only federal groundwater protection program applicable to the great majority of potential groundwater contamination sources.

By contrast, consider the groundwater protection program of RCRA which applies at least in principle to the fourteen hundred hazardous waste disposal facilities now awaiting permitting. I say "awaiting" because only eight land disposal facilities have received their permits under RCRA. EPA is still processing the applications of the remainder. EPA's program for protecting the groundwater around hazardous waste facilities has two basic parts. The first is a series of groundwater protection measures that facilities must take in order to obtain their permit to operate, measures such as installation of double liners and leachate collection systems to intercept contamination before it can enter the groundwater, limitations on what wastes can be placed in a landfill to preclude those which have the

greatest potential for migrating from the facility and a cover system to be installed at closure that will exclude most precipitation from entering the closed disposal facility. Our members support these requirements and comply with them.

It is the second part of EPA's program, the monitoring of groundwater around hazardous waste facilities that is of greater concern to us. We support a groundwater monitoring program for hazardous waste facilities but not the program that EPA is currently implementing through its guidance to EPA regional offices and the states. Currently, our members are sampling more than fifteen hundred monitoring wells at their forty regulated facilities and by the time a critical deadline arrives in November, they will be monitoring approximately eighteen hundred-fifty wells. On the average, there will be forty-six wells per site and at some sites the monitoring wells number in the hundreds. Every facility operated by our members has at least the four wells that is the regulatory minimum and all but five of the facilities have at least ten monitoring wells.

The goal of EPA's compliance monitoring program is to ensure that leakage of hazardous constituents in the groundwater "does not exceed" acceptable levels. This is a reasonable goal one which we support. The goal was changed considerably, however, as it was translated into monitoring hardware and action. In the draft guidance we find statements that there must be enough wells at the right location to "immediately determine" contaminant leakage. Wells must be placed so

that "all pathways of contamination are monitored". Wells must be placed closely enough to ensure "complete uncertainty" that the groundwater monitoring system will detect leaks. The ambient monitoring system thus has become a leak detection system and a nonsensical leak detection system at that. Our members tell us that in order to comply with the draft guidance, they will have to increase the number of monitoring wells from 1,850 that will be in place by November to approximately 7,200 at their 40 sites. The average monitoring well costs about $15,000 to install and a single analysis for the constituents on the Appendix VIII list costs in excess of $3,000. If the draft guidance is applied, our industry is facing additional capital costs beyond those already committed of more than $80 million and annual analytical expenses of more than $40 million. If we extrapolate the costs to all of the RCRA regulated community including on-site facilities and we assume that eventually EPA will apply the same rules to on-site facilities as off-site, we are estimating that there will have to be a total of 90-100,000 monitoring wells installed at a capital cost between $1.2 and $1.5 billion and the annual operating cost for analysis will be approximately half a million dollars. This program has the potential to produce sixty million data points annually which must be logged, evaluated, analyzed to be of any use. EPA has not divulged its own economic impact analysis of the RCRA groundwater monitoring guidance if in fact the Agency has considered economics at all. Isn't it about time that they open up this program to public comment and scrutiny? How many

regulations with a billion dollar price tag can be put into effect without going through a formal regulatory process.

In contrast to the fact that each of the commercial sites we represent has installed at least the minimum monitoring system required, recent congressional investigations have uncovered the fact that fifteen percent of the on-site facilities, i.e., facilities operated by generators for disposal of their own wastes, are not even monitoring groundwater at all and that nearly twenty-five percent of the on-site facilities have inadequate well systems. To put it another way, while all 40 of our facilities monitor groundwater, 188 on-site facilities don't bother. It appears that EPA has a double standard even within the stringent RCRA program. The next round of compliance and enforcement attention might well focus on the on-site facilities.

Let's examine the RCRA groundwater monitoring program in some detail. The program is embodied in both interim and final regulations that have been adopted following public comment and review according to established procedures. These regulations are being implemented however by means of draft guidance documents that have been circulated to the state and regional regulators but have <u>never</u> been reviewed or even seen, at least officially, by the regulated community. In drafting the regulations and the guidance, the Office of Solid Waste did not have the benefit of comprehensive groundwater monitoring guidance that would have been available had there been a real EPA

groundwater protection program. Not surprisingly the RCRA monitoring guidance contains serious flaws, three of which I want to mention today.

First, the Agency's monitoring guidance is flawed because it inextricably confuses the concepts of compliance or emission monitoring with the concept of ambient monitoring. Draft guidance documents reflect the premise that it is very important to be able to detect leaks from hazardous waste facilities immediately upon occurrence, i.e., to monitor for emissions. In addition, the Agency wishes to determine groundwater quality in the vicinity of hazardous waste sites, in other words to conduct ambient monitoring. These two substantially different objectives have been mixed to the detriment of both because effective systems to satisfy these two legitimate objectives of monitoring will differ in terms of the appropriate frequency of measurement, parameters to be measured, number of measuring points, as well as differing in the consideration of the local geohydrological environment in which the facility is located.

Let's consider just one of these parameters; frequency of sampling. If the goal of a measurement system is immediate detection of a leak from a landfill facility, then obviously the sampling must be reasonably frequent. An ideal system would incorporate continuous monitoring of a few parameters that would immediately detect the onset of a leak. By contrast, a monitoring system designed to detect changes in groundwater quality rather than the on-set of a leak would

require only relatively infrequent monitoring because of the slow rate at which groundwater moves in most geological settings but the analyses should include all potential contaminants for which there is environmental concern. The monitoring protocol should be designed to meet the objectives of the monitoring requirement. By requiring one monitoring system to satisfy both sets of objectives, emissions and ambient water quality, the Agency's proposed program inevitably compromises the results and provides in many cases data that are not only less than ideal but do not answer either of the questions at issue or meet either objectives.

This affects costs as well. It has lead to the enormous increase in the required number of monitoring wells, the great numbers of substances being analyzed for and sampling more frequently than necessary to detect trends in groundwater quality.

There is a clear analogy to the monitoring programs involving other environmental media, for example, air quality monitoring. Imagine a single factory with a single stack and suppose it were necessary to determine the emissions from the stack and the quality of the ambient air around the stack. If one were to try to do this with a single set of monitoring points, one would be forced to place a large number of monitors at the property line at various heights and measure the air quality at those monitors in conjunction with meteorological data. One could then determine both the emissions and the ambient air quality with a single, albeit very large number of

monitoring data points. Needless to say, this is not the way it is done. Emissions are determined by measuring directly in the stack and ambient air quality is measured at receptor points downwind. Air monitoring systems are tailored to meet their specific objective.

A second major flaw with EPA's proposed program is that it appears to be predicated upon the Agency's experience in dealing with CERCLA (Superfund) abandoned sites and also with facilities established before the provisions of RCRA established the groundwater control requirements applicable to land disposal facilities. The draft guidance appears to assume that its required monitoring systems are being designed for hazardous waste facilities which are unlined and which allow leachate to flow directly into the groundwater. The guidance should be developed using the precepts that underlie the RCRA facility design requirements. In the case of the pre-RCRA non-regulated facility, discharge of leachate from the facility may and probably will occur all across the bottom of the facility, thus producing plume whose areal dimensions in terms of groundwater impact can be measured in acres. On the other hand, at a facility which is regulated under RCRA and which has the required double liners and leachate collection systems, leaks will be very localized and their area measured in terms of square inches rather than acres.

How would this affect the design of a monitoring system? First, as mentioned the plume of material entering the groundwater from a non-RCRA facility would be very large and readily detectable with

monitoring at discrete points. On the other hand, the leaks that might occur from RCRA regulated facilities will tend to be very localized. Detection by monitoring at finite points however closely spaced or frequently monitored will be uncertain at best. In fact, the liner/leachate collection system called for in the RCRA facility design guidance incorporates a leak detection system that is superior to anything that could be provided by groundwater monitoring around the facility. The lower of the two required leachate collection systems can be considered to be a leakage detection system applicable at once to the entire facility. Why require a costly but inferior leak detection system when a better one is intrinsic in the facility design?

The third flaw stems from the choice of chemical compounds which the Agency is proposing to be measured. In particular, the draft guidance reflects EPA's apparent belief that it is important to establish what are called "concentration limits" for each of the more than three hundred fifty compounds listed in Appendix VIII of the Agency's RCRA regulations. Presently, however, there does not exist a framework for understanding the significance of concentration measurements for most of these three hundred fifty chemicals. There are no standards for the great majority. Depending upon whether the Agency intends to determine ambient trends or to detect leaks, apriori information should be available as to whether or not the contaminants are of concern and what concentration levels are significant. Since contaminants can be detected at very very low levels -- often parts

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per billion or even less -- it is necessary to take into account the limitations of the analytical methods typically used by laboratories in analyzing groundwater samples and the uncertainties associated with interpreting their results. When such considerations are weighed, it is clear that for many of these chemicals the mere detection of trace levels is not in and of itself significant.

This issue -- the interpretation of the results of groundwater monitoring is by far the most critical. What are the "acceptable levels" of contaminant concentrations in groundwater that are not to be exceeded around hazardous waste disposal facilities? For the mere handful of chemicals, less than twenty, for which there are established drinking water standards, the national interim primary drinking water regulations provide the maximum concentration levels. For the vast bulk of the more than three hundred fifty substances comprising EPA's shopping list of hazardous constituents, the maximum concentration is set at the background level of the constituent in groundwater around the facility. Since most of these chemicals do not occur naturally in groundwater, the background level is zero and thus the acceptable level is zero. In the science of analytical chemistry, however, zero is not determinable; rather, each substance evaluated has a certain detection limit. The careful analytical chemist will report a zero as "not detected" since he has no way to know whether the compound is truly absent or present in concentrations less than the detection limit.

For most of the hazardous waste constituents, the actual acceptable limit is in fact the analytical detection limit. If it can be detected, it exceeds background and therefore is not acceptable. To further confound the situation, the methods of analytical chemistry are being improved continually and levels of detection are much lower today than they were only a few years ago. Thus we have the situation wherein the acceptable limits are being determined not by established health effects but rather by the limits of chemistry. The analytical chemist is, in effect, in the position of the regulator -- as he gets better, the regulations become more stringent.

In summary, the flaws in EPA's regulatory scheme for protecting groundwater around hazardous waste facilities have come about because the regulators have been forced to deal with this important issue without having a framework in which to judge how to protect and measure groundwater quality. There needs to be an overall groundwater protection strategy which applies to all of the sources of groundwater contamination not just a few that are particularly visible. There have to be standards for many more substances than those few for which there are drinking water standards. In this regard, both the Senate and House bills to reauthorize the Safe Drinking Water Act require EPA to promulgate a great many additional drinking water standards within three years of enactment. This is a good move, long overdue. Unfortunately, the critical dates for RCRA enforcement come up in 1985 not 1988. A comprehensive groundwater monitoring program may very well include a prohibition on certain activities over particularly

sensitive aquifers as part of its protection scheme. It may well incorporate prohibitions on the use of certain materials in ways that can contaminate groundwater or possibly even an outright prohibition on the manufacture of certain substances. There are many potential elements of a comprehensive groundwater protection program. But it makes no sense in our view to regulate a few dozen potential groundwater contamination sources to the very hilt while at the same time ignoring hundreds of thousands of other known polluters.

ENVIRONMENTAL POLICY INSTITUTE

Testimony of
Velma M. Smith
on behalf of the
Environmental Policy Institute
and the
Natural Resources Defense Council

before the

Senate Committee on Environment and Public Works
Subcommittee on Toxic Substances and Environmental Oversight

July 16, 1985

Mr. Chairman, members of the Committee, I appreciate the opportunity to testify today on behalf of the Environmental Policy Institute (EPI) and the Natural Resources Defense Council (NRDC). Each of these non-profit environmental organizations has been working for some time on efforts to enhance the protections afforded to groundwater. We commend you for initiating this important series of hearings, and we are particularly pleased that you have chosen to focus today on the EPA Groundwater Protection Strategy.

To summarize very briefly, EPI and NRDC find the Groundwater Protection Strategy short on action, overly reliant on study where considerable data already exist, and premised on faulty assumptions.

EPA assumes that the federal government should defer to the states on all points of groundwater protection. We believe that the federal government should be the leader in groundwater protection.

EPA assumes that we can do no better than to continue the contamination of certain groundwater resources. Their economic arguments would justify making precious renewable resources into nonrenewable and unmanageable waste repositories. We would pose the economic balancing questions in a different light, and ask this generation to forgo the unwise use of chemicals rather than ask future generations to forgo the use of groundwater resources.

We urge you to respond to this Strategy with articulation of a national goal to protect and enhance groundwater resources, in keeping with resource protection goals in other federal environmental laws. Congressional direction for a federal program based upon this goal would then be in order, and we believe that, to be truly effective, any such program would center on efforts to make our society "chemically tight."

Regrettably, we must characterize the EPA approach as disappointing and unimaginative. This is not to underestimate or

trivialize the difficulties in tackling the groundwater problem. Groundwater has been one of the most neglected resources -- virtually ignored while protections for air and surface water were formulated. A vast resource, difficult to monitor, and subject to contamination by many activities, groundwater presents a major challenge in conservation.

Successful solutions for the host of complex problems associated with groundwater contamination may not be immediately apparent, but we had hoped that after several years of background work and development, the Agency would be in the position to set out an aggressive program to combat contamination.

On the contrary, this Strategy is a passive one which might fairly be called a paper tiger in terms of protection. Beyond disappointment, however, we are seriously concerned that the Strategy, with its strong reliance on the three-tiered classification approach, could lessen current protections for groundwater. If the public and the Congress choose to ignore the implementation of the Strategy, they may find at some point in the future that our options for the use of clean groundwater have been diminished. That possibility makes this hearing most important.

In a more positive vein, we credit the authors of the "Findings" section of the Strategy with recognizing the growing extent of groundwater problems, the large number of threats to groundwater, and the unacceptably high costs of cleanup. In EPA's words,

> The importance of the ground-water resource will continue to increase. The present ground-water contamination problem is expected to appear more severe as additional information is collected, because the probability that many sources are contributing to the problem is high....Once contaminated, ground water presents particularly difficult problems for monitoring and clean-up.... It seems clear to many that we must direct our energies to minimize future contamination....

Unfortunately, when it comes to recommendations, these authors appear to have been replaced by others unacquainted with the problem. The timid approaches recommended do not suit the serious and growing problems outlined in the early section. In our view, this failure and much of what is wrong with the Strategy may be attributed to faulty assumptions and narrow goals.

First, the Strategy begins with the assumption that no new legislation is necessary. EPA has considerable, but unused, discretion under a variety of statutes that might be applied to groundwater protection. Nonetheless, it seems both unnecessary and unwise to begin by assuming no new authority

without first carefully evaluating the need for new authorities. As members of this Committee well know, the Agency is often fond of pointing out that technical expertise and understanding are the strength of the Agency -- not of Congress. Why then is EPA so unduly shy about making suggestions for legislative change?

Since EPA has not been aggressive in testing the range of its existing authority -- in program action or in Strategy recommendations -- we hope that Congress will provide some direction on groundwater, and we look forward to proposed legislation discussed by Senator Durenberger.

The EPA Strategy clearly assumes that the primary responsibility for setting goals and for implementing protections belongs with the states. EPI and NRDC recognize the legitimate role of the states in solving problems with widely varying origins and manifestations, but we believe that the traditional role of the federal government in resource protection and conservation must not be overlooked.

As you pointed out in an earlier hearing, Mr. Chairman, it is the federal government that we must generally rely upon to take the long-term view and protect resources for future generations. And, as other witnesses noted, it is only a strong

federal standard and presence which assures that we will not have certain states relegated to the position of pollution havens. Thus, we need a federal program which includes a clearly articulated goal of protection and enhancement of groundwater resources nationwide.

We believe that our goal must be one of no releases, either deliberate or inadvertent, that would adversely affect the resource. Achievement of a nondegradation goal, as it has been called, is beyond our ability today, but such a goal would help to force technology, to push us toward that "chemically tight" society, and to make our activities consistent with the goal of assuring that water is available for future users.

EPA, in contrast, has chosen for the federal government a minor role and a goal which might best be dubbed "selective contamination."

Some years ago, the conventional wisdom held that much of our groundwater was somehow immune to contamination. Today's monitoring results belie that theory of magical natural cleansing, and we now recognize the need to protect groundwater from at least certain contamination sources. EPA, however, is reluctant to break clean with old habits and has offered us a

Strategy which sanctions the use of certain water resources as a convenient and supposedly cheap natural sewer system -- not only today but into the future.

This questionable premise for "protection" yields an unimpressive Strategy. There are four so-called core elements to the Strategy that can be examined. The first is to "strengthen state ground-water programs."

In this section, EPA makes some of its strongest arguments and would appear to set as its highest priority assistance to state programs.

> EPA believes that the most effective and broadly acceptable way to increase national institutional capability to protect ground water is to strengthen State programs....While many States have expended substantial efforts to build and coordinate their State programs and have comprehensive programs that are in development or under operation, these efforts are still insufficient to ensure protection for a resource that demands a comprehensive approach....State institutions have been sorely taxed to take on new responsibilities, deal with contamination sources not covered by Federal statutes, and fashion a comprehensive effort to protect both the quality and quantity of their ground water.

But having made these arguments, EPA then proposes to assist the states through existing grant programs, thus offering the states the option of choosing groundwater protection in

exchange for some other existing program. The special funds referenced -- a total of $7 million for the development and implementation of groundwater programs in all of the states -- were earmarked in the EPA appropriation at the initiative of Congress, not the Agency.

Not only has EPA been reluctant to back up this identified high priority with adequate funding requests, but, in fact, the Agency has been active in opposing Congressional initiative -- in the form of the House Safe Drinking Water Act -- to foster state-initiated groundwater programs. Rather than suggest constructive improvements of that portion of Congressman Madigan's bill (H.R. 1650), the Administration has taken a seemingly unbending position of cutright opposition. This attitude is puzzling given the arguments made in the Strategy.

The second core element of the Strategy deals with contamination sources. Here the Agency proposes to cope with "inadequately addressed" or "unaddressed" groundwater problems. Although not extensive in scope or thorough in examination, the Strategy recognizes the diversity of the threats to groundwater. Much longer in the making than the Office of Technology Assessment's report, the Strategy offers limited discussion of the individual sources and selects only three for particular

attention: underground storage tanks; land disposal facilities -- specifically, surface impoundments and landfills; and pesticides and nitrate applications.

EPA proposes to study the effects of contamination from underground tanks. Thankfully, the Congress decided that the extent of this problem warranted some immediate action, and new safeguards on tank installation were put in place by the Resource Conservation and Recovery Act reauthorization. This instance provides a good example of EPA's hesitancy to undertake program change where existing data would justify action.

For surface impoundments and landfills, the proposal is again to study, and although EPA and the states have worked on waste disposal inventories in the past, the Strategy does not suggest how new study efforts will build on existing information. For pesticides, the plans are more clearly specified, and the Agency is to be commended for moving ahead on the pesticide data call-ins and a national survey of pesticide contamination. Unfortunately, the results of these actions may be long in coming -- particularly given the limitations of the EPA budget.

Admittedly, any attempt to tackle problem sources ranging from septic tanks and chemigation to nuclear waste repositories and oil drilling would be subject to some criticism. Our primary concern here is that the effort is so meager in what it attempts to cover; it is short on specific actions, priorities, and deadlines; and, indeed, its modest ambitions do not seem to be matched by realistic budget requests.

The third element of the Strategy is the "policy framework" to guide EPA programs. We have alluded to this section before, for the sum of EPA's proposed policy framework is a three-tiered classification system. As other witnesses have noted, classification has been set in many discussions as an alternative to a nondegradation goal. But classification, in itself, is not a goal. It is a tool that could be used for differing ends. In this case, we are concerned that it will be used to weaken protections on certain groundwaters.

We agree that classification could be useful in some instances in setting priorities for special protections of particularly vulnerable areas. We are pleased that EPA suggests banning the siting of hazardous waste disposal facilities over Class I areas and that they will be considering pesticide application restrictions in these areas.

It is difficult to judge the potential impact of such actions, however, when we have little information on which to estimate how many areas will meet the criteria for Class I as EPA envisions it. Thus far, we have heard Class I used only in reference to unique areas such as Long Island, Cape Cod and Hawaii. The too readily available contamination stories from the states suggest that, in addition to these areas, there may be many others which deserve special protection.

It seems likely that many areas will fall into Class II -- current and potential sources of drinking water. It is not clear how EPA would make these judgments. Will water serving private well users -- water that is generally untreated and untested -- be classed as currently in use, or will the Strategy follow the precedent of the Safe Drinking Water Act focusing exclusively on public supplies? Do the economics of today's treatment technologies provide the basis for valuing water resources that may be needed by future generations? The Strategy is not clear on these points, and it fails to mention how opportunities would be provided for meaningful public participation in such important decisions.

The Strategy states that Class II aquifers will "as a general rule" receive the levels of protection consistent with those now provided for groundwater. We are neither satisfied with the status quo in protection nor comfortable with what exceptions to the "general rule" there may be under this scheme. These concerns are obviously equally applicable to the application of Class III designations.

The EPA classification approach presupposes discrete and isolated water-bearing strata, but isolation is often poor and some aquifers cover vast areas. EPA also presupposes a reliable data base and an ability to predict with precision the movement of groundwater and of contaminants through the ground over long periods of time. While the state-of-the-art in predictive capabilities is advancing rapidly and may be reliable over relatively short time-periods on specific sites and assuming static pumping situations nearby, we are not confident that these predictive capabilities are sufficiently reliable for decisions that would "write off" certain segments of groundwater.

Furthermore, the Strategy and the federal budget situation give us no reason to trust that state-of-the-art technical capabilities and carefully researched and field-verified data will form the basis of decision-making. The

Science Advisory Board Committee looking at groundwater-related research needs has pointed out serious deficiencies in technology and information transfer. The SAB and the OTA also highlight the troubling shortage of trained personnel in this area. Both factors will affect the effectiveness of classification.

As outlined in the Strategy, classification will be developed in an ad hoc fashion, primarily as a response to RCRA permit applications and Superfund cleanup assessments. The federal government does not propose to develop an independent data base for classification decisions but will rely on information provided by the potential polluter. Is it any wonder that, under these conditions, we cast classification as a license to pollute with an uncertain outcome as to where the pollution will manifest itself?

EPI and NRDC have been working together and with other environmental organizations, including local and state groups, to develop some helpful alternatives to the EPA Strategy. We hope to offer further detailed suggestions that reflect the input of a large number of citizens and groups as the Chairman works on a national program proposal. At this point, we would suggest another general policy focus that might prove more useful than this questionable classification scheme.

We would strongly urge a policy focus to promote more conservative use of toxic chemicals. Rather than forcing future generations to forgo the use of water resources, would it not be reasonable to forgo the use of toxics in selected cases and to eliminate the generation of wastes wherever possible? The best use of groundwater, in our view, is not as a sink for chemical residues. Nor is the best use of toxic materials as an additive to groundwater.

EPA's focus, through research, regulation and incentive, should be one which results in product substitution, product reformulation, and process engineering changes to reduce pollutant volumes and chemical usage in general. Increased recycling would be an essential piece of this framework. The Office of Technology Assessment, in its 1983 report on hazardous waste, discusses several useful options for implementing such a policy, but the vision necessary for real solutions cannot be confined to wastes. The production and use of toxics in general must come under scrutiny.

Pollutant reduction has been discussed before. Every now and then it rates a line in the preamble of legislation. But with few exceptions, including the private initiatives of such companies as 3-M, it remains a "nice" but not too useful concept for public policy discussions. We think that can be changed, and it must be changed if we are to be successful in combatting groundwater contamination.

The final core of the Strategy is the strengthening of internal ground-water organization.

Here the Agency's task is difficult as well, because there exist many institutional and legal biases that can thwart coordination and program synthesis. The Office of Groundwater Protection has already begun to serve a valuable role as information-gatherer and clearinghouse, and if the existing bureaucratic compartmentalization can bend a bit, OGP may become the much-needed intermediary that assures that various offices confer with one another on groundwater related decisions.

A first important task for in this coordination function may be to assure the use of compatible data management and monitoring protocols among the various divisions. Coordination in

setting of research priorities and sharing of research results would also appear to be extremely important.

Beyond the intra-Agency coordination, there is a pressing need for broader federal coordination. EPA and Geological Survey efforts are obvious candidates for coordination, and a Memorandum of Understanding has been signed by the two agencies. The activities of a whole host of other agencies may also affect groundwater, however. As an earlier witness from New Mexico pointed out, the federal government is a large landowner and potential polluter. Existing literature documents serious existing problems at Department of Energy and Department of Defense facilities in particular.

We believe that each federal agency's activities related to environmental assessment, control, and response should be reviewed for consistency with groundwater protection goals. In addition, the coordination or pooling of resources devoted to these activities within each agency might help to achieve some cost-effective improvements in groundwater protection. The Department of Defense, for example, now spends nearly $300 million per year on groundwater monitoring alone. That figure

dwarfs the EPA Superfund monitoring budget and that of the U.S.G.S., and we wonder if the apparently extensive DOD program allows for piggy-backing of other monitoring efforts.

In sum, the protection of groundwater resources is a tough task -- tough for EPA, for citizens, for industry and for Congress. It deserves carefully researched technical backup and well-reasoned policy direction. But it cannot wait much longer. We must get on with the task that the EPA Strategy merely delays. We look forward to working with you and with EPA for both immediate and long-range improvements in groundwater protection.

★ FARM BUREAU ★

★★ the nation's largest general farm organization ★★

STATEMENT OF THE AMERICAN FARM BUREAU FEDERATION
TO THE SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE
BEFORE THE SUBCOMMITTEE ON TOXIC SUBSTANCES AND
ENVIRONMENTAL OVERSIGHT
REGARDING GROUNDWATER CONTAMINATION

July 16, 1985

Presented by Mark Maslyn
Assistant Director, National Affairs Division

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The American Farm Bureau Federation is the nation's largest general farm organization with over three million member families. in 48 states and Puerto Rico. Farm Bureau members produce nearly every agricultural commodity grown or raised in commercial quantities in the United States.

As this and other recent hearings have demonstrated, the subject of groundwater contamination is relatively new to the vocabulary of most people. Heretofore, there has not been a concentrated public effort to understand, in a comprehensive way, the nature of groundwater contamination and all of its ramifications.

From an agricultural and rural perspective, groundwater is a vital and natural resource, and its potential contamination poses very serious and unique problems. To illustrate this problem, we need only point out that 68 percent of the nation's total groundwater use is for cropland irrigation. Ninety percent of our rural population relies on groundwater as a source of drinking water. Complicating this is the fact that agricultural pesticides, fertilizers, and some farming practices have been cited as sources, or causes, of groundwater contamination.

The farm community is faced with an obvious dilemma between the need to ensure that millions of private wells in our rural areas remain a safe source of drinking water, and a recognition that it may be irrelevant if the means to achieve that end make farming and ranching an unprofitable or impractical venture.

We have reviewed the EPA groundwater protection strategy, and believe that it provides a good framework for effective action on this important issue. The strategy will establish EPA as the focal point and coordinator of federal groundwater activities while providing the states with much needed information and technical support. Equally as important, strategy makes clear the roll of the states and local governments as the principal architects, implementers, and managers of groundwater protection activities. This is a fundamentally important point due to the localized site specific, soil specific nature of the problem.

We believe that it is positive and constructive that the program does not attempt to identify "villains" of groundwater contamination. Frequently, the private sector's best efforts to be environmentally responsive in one area have inadvertantly contributed to problems in

another area. Such could well be the case in agriculture as we redouble our efforts to reduce surface run-off for purposes of non-point source pollution reduction. It may later be determined that reduced run-off increases percolation in groundwater. To look for "villians" will simply detract from the need to move ahead with appropriate responses.

We support many of the efforts being proposed by EPA to protect groundwater from pesticide and nitrate contamination. Specifically, we support requiring manufacturers to provide data on leaching potential as part of the registration and reregistration process. The use of computer modeling techniques will be helpful in evaluating the likelihood of pesticide migration. This could also be very useful in extension type programs where specific hydrological and soil type information could be used to estimate the migrating potential of a pesticide on a specific farm.

EPA must do more to evaluate the potential health effects of pesticide contamination in groundwater. Our ability to detect minute traces of contaminants has far exceeded our ability to interpret exactly what if any health effects they may have. The lack of sound reliable information has led to hysterical and knee-jerk reactions on the part of many state and local officials when these contaminants are found. The result is that action levels and health advisories have been set by state and local officials in a highly charged political environment rather than a scientific one.

A primary concern of Farm Bureau with any groundwater legislation is that of retroactive liability. We do not condone the deliberate and unlawful misuse of pesticides and believe that current statutes are sufficiently armed to deal with such violations. The vast majority of farmers, however, are conscientious and careful about the proper handling, application, and disposal of pesticides. Nonetheless, recent incidents of groundwater contamination have left good farmers liable for potable water requirements and clean-up costs. Our statutes need to recognize the plight of the conscientious producer who follows federally approved label instructions. We recommend that compliance with pesticide label instructions should absolve farmers from liability claims of environmental pollution.

Any discussion of groundwater contamination also must consider the link between water quantity and water quality from agriculture's perspective. The withdrawal of irrigation water from an aquifer may lead to saltwater intrusion, a higher concentration of contaminants or induce recharge of the aquifer by contaminated surface streams. In addition to being protected from liability for what is a normal and routine agricultural activity, protection of water rights is essential for continued agricultural production.

We are concerned about the use of labeling to restrict the use of pesticides in certain geographic areas because of soil type, hydrogeology and groundwater use. While this approach is preferable to the

total cancellation of a particular product, we believe very strongly that abatement of the contamination should not be the sole critera for action and consideration should be given to the economic effects of that decision upon local agricultural production.

The use of groundwater classification is preferable to a policy of non-degradation and probably the most appropriate approach for agriculture. Nevertheless, the underlying objective is obviously to restrict or limit certain land use practices according to the groundwater class. We believe that proposals must be flexible and take into account regional, geographic, topographic, and demographic differences. State and local governments are by their proximity best suited to make these decisions.

EPA also needs to recognize and resolve what appear to be potential conflicts between this strategy and other EPA priorities. For example, private sector efforts to curb farmland run-off and non-point source pollution have led to the development of many new technologies in agriculture over the past decade, including the use of best management practices (BMP's) in many farming operations. It has long been recognized that one of the negatives associated with the use of some agricultural non-point source control practices has been the potential for increased migration of pesticides and nitrates into groundwater. EPA needs to clarify their objectives with regard to these two very important but potentially conflicting priorities.

The farm community recognizes the major agricultural sources of groundwater contamination and is working to address them. The reduced loss of fertilizer-derived nitrates is being achieved by the development of new technologies such as slow release fertilizers. The application of nitrogen fertilizers through sprinkler and drip irrigation systems are also showing positive results on the farm. Still another technique involves the use of inhibitors which delay the transformation of nitrogen to nitrate in the soil, resulting in more effective use of nitrogen by crops. The use of inhibitors in Minnesota has shown very positive results, producing greater corn yields as a result of the prolonged retention of nitrogen in the soil.

Efforts are also being directed at reducing the potential for pesticide contamination of groundwater. The use of integrated pest management practices, the use of chemigation (the application of pesticides through irrigation) and better understanding by farmers of the factors which influence the migration of pesticides to groundwater. All of these practices are being employed to prevent further contamination.

The agricultural community has undertaken many initiatives in its own right to inform and educate farmers on ways to minimize and prevent groundwater contamination. Early this year, Farm Bureau, the National Agricultural Chemicals Association and USDA-Cooperative Extension sponsored a pesticide, waste disposal workshop, exploring the latest technologies available for the safe disposal of pesticides, rinsates, and methods to avoid potential groundwater contamination.

Several of the Northwestern State Farm Bureaus have established the Pacific Northwest Water Congress. Agriculture's impact on groundwater quality has and will continue to be one of their primary concerns. Maine and Oregon Farm Bureaus have been successful in initiating and implementing pesticide container disposal programs in their states. Many State Farm Bureaus have lobbied hard for the establishment and funding of integrated pest management programs within their states. Farm Bureau, the National Agricultural Chemicals Association, USDA-Cooperative Extension and the Agricultural Aviators Association are in the process of producing an agricultural practices booklet aimed at the proper and safe use of agricultural chemicals to prevent groundwater contamination. The Farm Bureau has initiated an organizational effort to inform and educate our members about the problem and what can be done to avoid groundwater contamination on their farms.

We support your support for the goals and objectives of the groundwater strategy. With certain exceptions, we believe it is an effective blueprint for addressing the groundwater contamination problem and focusing public attention on this emerging issue. We share your concern that groundwater quality and the prevention of groundwater contamination is an issue that must be addressed. We commend you for holding these hearings and look forward to working with you in the future as this process continues. Thank you very much.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
TESTIMONY TO THE
SUBCOMMITTEE ON TOXIC SUBSTANCES AND
ENVIRONMENTAL OVERSIGHT
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

Presented by

Linda H. Bochert

Executive Assistant to the Secretary

July 16, 1985

My name is Linda Bochert. I am appearing on behalf of the Wisconsin Department of Natural Resources (DNR) and its Secretary, C. C. Besadny. I am the Executive Assistant to the Secretary of the Wisconsin DNR. The Wisconsin DNR has broad environmental protection and resource management responsibilities ranging from managing parks, forests, fish and game, to administering air pollution, water pollution control, solid waste, water resources management and drinking water programs. Among other things the agency is charged in state statutes to "serve as the central unit of state government to protect, maintain and improve the quality and management of the waters of the state, ground and surface, public and private." We are pleased to have the opportunity to testify to the Subcommittee on Toxic Substances and Environmental Oversight regarding Wisconsin's Groundwater Program and EPA's Groundwater Protection Strategy.

Wisconsin is heavily dependent upon groundwater. All but 19 of our 550 municipal water supplies and 100 percent of our rural and suburban residents are dependent upon wells for their drinking water supply. We adopted the nation's first well drilling code in 1936. When Wisconsin assumed responsibility for issuing wastewater discharge permits in the early '70's, we required permits not only for surface water discharges but for discharges to groundwater as well. All of our aquifers are presently used as drinking water sources and all of our groundwaters are defined in state statutes as "waters of the state." A magazine supplement entitled "Groundwater - Wisconsin's Buried Treasure" is being provided to your staff.

In January, 1982, in response to groundwater contamination incidents and groundwater-related controversies on pesticides, mining and landfill siting, the Wisconsin Legislative Council established a Special Committee on Groundwater Management. That committee's work resulted in development and passage (in May, 1984) of perhaps the most comprehensive state groundwater legislation in the nation, 1983 Wisconsin Act 410. Copies of the legislation as well as summary and background materials are being provided to your staff.

Newly created Chapter 160, Wisconsin Statutes, establishes a framework for state groundwater quality standards. A unique two-tiered approach is used where two types of standards are established for each substance. The "enforcement standards" are established to protect public health and welfare and are similar to primary and secondary drinking water stnadards (called maximum contaminant levels). The enforcement standards are to be based on what's defined as "federal numbers" where such federal numbers exits. A "federal number" in our legislation is defined as an EPA maximum contaminant level or an EPA drinking water advisory level. We utilize federal numbers because they represent the best and most widely accepted information available. The second type of standard is called the "preventive action limit." This is established at a designated fraction (10, 20, or 50 percent) of the enforcement standard. The preventive action limits serve two purposes. First, is the prevention function: facilities must be designed and practices must be managed to comply with the preventive action limits. Second, they serve as a trigger for early remedial response: if a preventive action limit is reached, action must be initiated to assure that the enforcement standard will not be exceeded. We have adopted enforcement standards and preventive action limits for 49 substances. Copies of the rules are being provided to your staff.

The legislation embodies our state's groundwater management approach:

- Uniform protection for all aquifers. The standards apply uniformly to all Wisconsin groundwaters. No aquifers are "written-off" since they are all already being used as drinking water sources. We recognize that due to varying land uses and natural susceptibility, different types of protection measures are required in various locations to achieve the same standards.

- Emphasis on prevention - Our groundwater management program emphasizes stringent design and siting requirements for the many types of regulated facilities, activities and practices which can threaten groundwater quality. By requiring that facilities be designed to meet "preventive action limits" (a fraction of the health and welfare limits called "enforcement standards"), we assure the continued use of stringent designs to prevent contamination from occurring. This emphasis on prevention and minimizing impacts on groundwater quality is more efficient and technically feasible than relying entirely on expensive remedial attempts.

- Limited degradation. Our standards recognize that absolute non-degradation, although perhaps a nobel goal, is simply not achievable or even measurable. The standards provide the means to measure which impacts are allowable and, where necessary, the degree of clean-up which will be required.

- A multi-agency approach. The Wisconsin Department of Natural Resources is the "central unit of state government" for management and protection of the "waters of the state." WDNR adopts the groundwater standards and administers the state programs for drinking water, solid and hazardous waste, wastewater and spills. Many other state agencies have responsibilities related to management of groundwater. For example, the Wisconsin Department of Agriculture, Trade and Consumer Protection regulates pesticide use, pesticide storage and fertilizer storage. The Wisconsin Department of Industry, Labor and Human Relations regulates septic tanks and the installation of underground storage tanks. The Wisconsin Department of Transportation regulates the storage of road salt. The Wisconsin Department of Health and Social Services provides recommendations on groundwater standards and drinking water standards. The Wisconsin Geological and Natural History Survey maps the hydrologic and geologic characteristics of the state. The University of Wisocnsin has educational and research responsibilities. All of these agencies must comply with the state groundwater standards. Their efforts are coordinated through the Wisconsin Groundwater Coordinating Council which was created in our legislation.

Federal efforts have been increasing in groundwater protection. EPA is to be commended for creating an Office of Groundwater Protection and for preparing the EPA Groundwater Protection Strategy. We would, however, like to make several points regarding the federal role in groundwater management and EPA's Groundwater Protection Strategy.

1) Federal efforts should reinforce the state's lead role. States, cooperatively with their local units of government, are best equipped to carry out the regulatory programs for management of groundwater quality. There are many legitimate reasons why groundwater should be managed differently in different parts of the nation: natural water quality varies, availability and use vary, the types of problems vary and land use varies. National uniform management of groundwater is neither needed nor desirable. We support the portion of the EPA Groundwater Protection Strategy which recognizes the lead role for states.

2) Increased federal effort is needed in the development of health advisory levels and toxicological information for contaminants in groundwater. A multitude of contaminants are being found, and health-related judgments are necessary. Wisconsin and many other states are adopting groundwater standards, but states shouldn't need to individually interpret research data. That clearly should be a federal role.

   We are not necessarily suggesting more maximum contaminant levels and monitoring requirements applicable to public water systems. Published and widely accepted federal health advisory levels would meet our needs equally well. Recommended maximum contaminant levels (RMCLs) would be ideal if the language in the Safe Drinking Water Act were changed so that RMCLs were based upon an acceptable risk level rather than a zero risk level as they presently are. The EPA Groundwater Protection Strategy does not adequately emphasize the need for accelerated federal standards development. It does discuss the need for consistency within EPA programs. From our experience in Wisconsin, as well as from our contacts with EPA staff, it's clear that federal health advisory levels for contaminants being found in groundwater would not only assist the states, but greatly improve consistence among EPA programs (SDWA, RCRA, FIFRA, CERCLA, TSCA and CWA) as well.

3) Aquifer classification systems should be optional with the states. For some states where water quality varies considerablyor where some aquifers aren't used for drinking water, classification makes good sense. For many other states like Wisconsin, it doesn't make sense at all. We've looked at aquifer classification; our Legislature has looked at aquifer classification; and we've decided it's not an appropriate management tool for our state. We haven't found a landowner yet who wants the aquifer under his residence classified for something other than a drinking water source. Most of our decisions are site specific based on soils, geology, direction of groundwater flow and proximity to wells. They are not areawide decisions such as "in what portion of a county should pollution be allowed?" We have a very strong and successful program using standards that apply uniformly to all aquifers is best suited to Wisconsin. We do not want any sort of an aquifer classification scheme imposed upon our state under the guise of a need for consistency among EPA programs. The EPA Groundwater Protection Strategy, in our opinion, greatly overemphasizes aquifer classification systems.

4) EPA should initiate a national groundwater monitoring and research program cooperatively with the states. The Office of Groundwater Protection is preparing an EPA groundwater monitoring strategy. We served on the advisory committee. It's clear that there needs to be an EPA coorcinated effort to better identify and assess groundwater problems that may be of national significance, to collect and manage data which are available, to develop monitoring guidelines and to develop best management practices. It's also clear that the states are in the best position to carry out groundwater monitoring and to identify research needs. EPA needs to increase funding levels for these activities substantially. The EPA Groundwater Protection Strategy recognizes that there are needs related to monitoring and research, but it does not commit to seeking more funds and it does not recognize the role of states in these areas.

5) New federal groundwater legislation should be developed. The legislation should establish a deadline for states to develop an EPA approved groundwater program. EPA should be required to adopt regulations specifying the elements to be included in state programs if they are to be approved. The legislation should emphasize preventive programs (to give some balance to strong emphasis on remedial actions presently in the CERCLA). The legislation should enable states, as part of an approved federal program, to develop groundwater standards no less stringent (with an option for being more stringent) than the federal health advisory levels. EPA programs should be required to comply with state groundwater standards when the state program has been approved. We believe that portions of the surface water program under the CWA could serve as a model for this legislation. Finally, the legislation should provide increased federal funding to strengthen federally approved state groundwater programs. States particularly need assistance in funding programs related to coordination of state programs, policy development, state and local groundwater planning, groundwater monitoring and data management. The EPA Groundwater Protection Strategy recognizes the need to strengthen state programs. Congress is to be commended for making funds available to states for this purpose. This is an area however, where presently available funds are grossly inadequate and where funds are needed for continuing programs rather than only for program development.

We look forward to working with the Subcommittee and the staff in sharing our experiences in Wisconsin and in developing federal programs. For further information please feel free to contact our agency.

Contacts: Lyman F. Wible, Administrator
Division of Environmental Standards
608/266-1099

Kevin K. Kessler, Chief
Groundwater Management Section
608/267-9350

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